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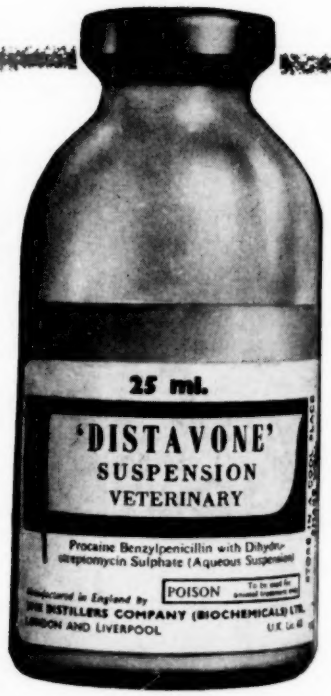

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Phenothiazine

I.—The Effect of Purity and "Dose Area" on its Anthelmintic Efficiency in Sheep

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SUMMARY.—Evidence is presented which indicates that the anthelmintic efficiency of phenothiazine in sheep improves with increasing purity. When used at recommended dose rates the activity of phenothiazine of 85 per cent. purity and above is generally good. When purity falls below 85 per cent. the efficiency becomes rather low and also unduly variable.

The effect of particle size is also demonstrated, but it is considered that this is best expressed in terms of "dose area"—a product of dose in grams and fineness measured by specific surface area in cm.² per g. Higher "dose areas" gave greater efficiency than lower "dose areas," but it did not appear to matter whether a given "dose area" was obtained by a small weight of finely ground material or a larger weight of coarsely ground material, At the same dose weights finely ground formulations were better than coarsely ground formulations.

By calculation, it appears that for an anthelmintic efficiency of 90 per cent. a "dose area" of 185,000 cm.² with phenothiazine of 85 per cent. purity or 155,000 cm.² with phenothiazine of 90 per cent. purity is necessary.

Introduction

IT has been generally accepted that the particle size of phenothiazine (thiodiphenylamine) affects its anthelmintic efficiency in sheep. Various workers have shown that to obtain good results against *Ostertagia* spp. and *Trichostrongylus* spp. it is necessary to have a preparation in which 90 per cent. of more of the particles are less than 20 μ (Gordon, 1956 ; Douglas, *et al.*, 1956 ; Whitten, 1956 ; Thomas and Elliot, 1957 ; Kingsbury, 1958).

During the past few years there have been complaints from the field that standard doses of phenothiazine have, on occasions, given poor results, particularly against *Trichostrongylus* spp. and *Ostertagia* spp. Investigation showed that neither management nor faulty drenching technique was responsible and also that the materials used met with the accepted specifications for particle size.

The possibility of resistance was also considered since, in the United States of America, Drudge *et al.* (1957 a and b) had shown that resistant strains of *Haemonchus contortus* could develop if sheep were given free access to phenothiazine salt licks over long periods. It seemed unlikely however, that resistance was the cause of failure in Australia, since the intermittent and random treatments practised by the Australian grazier would not be conducive to the development of tolerance. Work by Sinclair (1953) would seem to support this, as he was unable to produce resistant strains in *Trichostrongylus colubriformis* experimentally.

It appeared therefore, that some factor related to the phenothiazine itself must be responsible.

Whitten (1956) had shown that varying results against *Trichostrongylus colubriformis* could be obtained by using phenothiazine of different origins. This could have been attributed to either the phenothiazines themselves or to particle size which was not stated.

Recently Douglas, *et al.* (1959) found that commercial phenothiazine with a mean particle diameter of 2 μ was approximately equal in anthelmintic efficiency to a purified preparation with a mean diameter of 4·8 μ. They therefore concluded that pure phenothiazine was more active than commercial.

In the course of a series of trials by ICIANZ relating to the anthelmintic efficiency of phenothiazine formulations, data were accumulated which indicated that such factors as purity and particle size had an important effect. While considerable information was obtained on the effect of formulation it was apparent that the above factors were most significant.

In the past, the analysis of phenothiazine for purity has usually been based on the determination of its nitrogen content and this method has not been very satisfactory as some of the impurities it contains also analyse as phenothiazine. Setting point has also been used as a measure of purity, but this too, can be misleading, particularly when comparing samples containing different impurities. The development of a chromatographic method of analysis by ICIANZ Central Research Laboratories (to be published elsewhere) has overcome previous difficulties and has enabled an accurate figure for the phenothiazine content to be obtained.

This paper has been compiled from our data to demonstrate the effects of purity, fineness and " dose area."

" Dose Area " and Expression of Particle Size

The usual practice of describing the particle size distribution of solid materials in terms of the percentage finer than some arbitrary figure is unsatisfactory mathematically and hides considerable variations that can occur. We have preferred to use the specific surface area (cm.^{2} per g.) and to express the various doses in terms of the " dose area," *i.e.*, the product of the specific surface area (cm.^{2} per g.) and the dose weight (g.). This treatment is simple mathematically and has the advantage of being appropriate to at least some of the main routes of biological action, *e.g.*, cuticular absorption.

Of the very many methods available for the estimation of the surface area of a fine powder, the two most commonly used in this kind of work are :

(*a*) Measurement of the particle size distribution by sedimentation analysis, from which the area is calculated, and

(*b*) Calculations based on the measurement of the permeability of a packed bed of powder.

Both methods have their limitations, but for all our studies we have preferred to use the former. This gives lower figures than the air permeability method and for this reason it is necessary to specify the method by which the specific surface area has been obtained.

The sedimentation method used followed standard practice. Assuming a phenothiazine density of 1·354 the settling times for particles of the diameter listed below were calculated, and the per cent. by weight of the sample failing to settle in these times (*i.e.*, the weight per cent. under the calculated size) was observed. From these observations, and some assumptions regarding mean sizes, the partial specific surface area was calculated for the fraction in each size range, using the formula.

$$\Delta S = \frac{44{,}300\ \Delta w}{d_{av}}$$

where ΔS = partial specific surface area for a given size range
Δw = weight fraction in that range
d_{av} = assumed mean diameter (μ) of particles in that size range.

The total specific surface area was found by summing these figures over all ranges.

The constant 44,300 is determined by the density and by the units used.

An example of the calculation, showing the assumptions made, is given in Table I.

TABLE I
CALCULATION OF SPECIFIC SURFACE AREA

Data		Calculations from data			
Dia. μ	Per cent. under dia.	Size range μ	Assumed mean dia. d_{av}	Weight fraction within range Δw	Partial specific surface cm.^{2} per g. ΔS
30	94·4	>30	40	0·056	62
20	88·5	30 –20	25	0·059	105
10	58·4	20 –10	15	0·301	890
8	49·3	10 – 8	9	0·091	448
6	38·5	8 – 6	7	0·108	685
4	23·6	6 – 4	5	0·149	1,320
		< 4	2·8	0·236	3,730
Specific surface area cm.^{2} per g.				=	7,240

In the tables of results of the 6 trials described, we have given (1) the particle size in terms of specific surface area (cm.^{2} per g.), (2) the dosage in grams, and (3) the product of (1) and (2)—the " dose area."

Methods

The sheep used in all trials were young Merino weaners approximately 6 to 12 months of age. In most cases they had a naturally acquired heavy infestation. Before commencing a trial faecal egg counts were carried out on 3 occasions over a period of 2 or 3 weeks and the sheep were graded into " flocks " of 20 to 30 animals based on these counts. This size was chosen as being convenient to handle, dose, kill and examine at one time. After dosing, which was by stomach tube, total faecal collections were made and all expelled large bowel parasites collected and counted.

All sheep, including the control undosed sheep, were killed 4 days after dosing and collections were made of worms remaining in the viscera. These were then counted by taking aliquot samples.

This report is based on results from 320 sheep distributed over 6 quite separate trials. Each trial was designed as a factorial experiment to assess the effect of changing a number of factors and the interactions of these factors. Each of the experimental treatments was given to 1, 2 or 4 sheep in each flock. To avoid bias, the allocation of treatments to sheep was strictly random within each flock.

Results

The experimental data and results of the 6 trials are given in Tables II to VII. The averages given are geometric, not arithmetic, means and where

no worms were found in an aliquot the number has been recorded as one-half.

The results of faecal counts of the large bowel parasite *Chabertia ovina* were used for checking purposes, but are not recorded in Tables II to VII, and were not used in the calculations of this paper. The only results used here are counts of worms remaining in the viscera after killing both treated and control sheep.

Interpretation of Results

(*a*) *General*

The focus of interest of this report is on the overall effects of purity, fineness and "dose area," rather than on the results of any one trial. Nevertheless, it is convenient to start by considering each trial separately. For each trial a standard statistical analysis was carried out using Yates' tabular method for 2^n experiments or modifications of it. A local electronic computer CSIRAC, for which a special programme had been written, was used to sort the data. The input data was the log of the number of surviving worms. All effects discussed below were found to be significant.

In Trial No. 1 (see Table II) the variables were purity, fineness of grinding and quantity of phenothiazine used. The 4 samples of phenothiazine differed in biological activity and these differences applied to the 4 types of worms present. In general, increased purity appeared to increase effectiveness, although results obtained with the highest purity sample were somewhat anomolous.

The greatest efficiency resulted from the higher "dose areas" irrespective of whether those were obtained by a low weight of finely ground material or a greater weight of coarse material. Thus 24 g. of coarse material was no more efficient than 15 g. of fine material. The latter, however, was superior to 15 g. of coarse material. The results also indicated that at a fixed "dose area," fine grinding is more effective than coarse grinding against *Ostertagia* spp. but not against *Chabertia ovina*.

Trial No. 2 (see Table III) includes 6 phenothiazines of different purity, and therefore gives more information on purity. It is clear that the fine and pure materials (H, I and J) were better than the coarser and less pure materials (E, F and G), but the two factors of purity and fineness are not clearly separated. There were no significant differences among the 3 higher purity samples, but it did appear that of the latter the material of highest purity (87 per cent) was superior.

In Trial No. 3 (see Table IV) variations in "dose area" are less pronounced than in Trial No. 2. The purest sample (R) was more efficient than the least pure sample (K) for all species of worm. In general the results indicated that effectiveness increased with the purity.

In Trial No. 4 (see Table V) each of the phenothiazines used was of high purity and even though the "dose area" varied considerably, little difference was found between the samples—all giving high efficiency.

Trial No. 5 (see Table VI) and Trial No. 6 (see Table VII) are like Trial No. 1 in that several dose weights were used. They thus include systematic changes in "dose area"—irrespective of whether these are obtained by varying fineness of grinding or dose weight. Variations in fineness are large in Trial No. 6, but small in Trial No. 5.

There were no significant differences between the phenothiazine samples (U and J) of 86 or 87 per cent. purity used in Trial No. 5, but all of these were superior to sample A 3 of lower purity. Again the effect of "dose area" was present, but in this trial it was not as marked as in Trial No. 1.

In Trial No. 6 purity, fineness and "dose area" are so varied that it is impossible to separate satisfactorily their individual effects on biological activity. It will be seen, however, that sample V was better than the other two samples. The efficiency of the treatments increased as the "dose area" increased and it appeared that at still higher "dose areas" samples F and W would be very little inferior to sample V. The highest purity sample (W) was better than the lowest purity sample (F) but its inferiority to sample V which was less pure, was in all probability due to the vast differences in their fineness of grinding.

This general survey of the experimental results indicates that high purity and high "dose area" of phenothiazine are primary factors for good anthelmintic activity in sheep.

(*b*) *Statistical*

In the statistical interpretation of the data all trials are considered collectively. In this way the effect of purity is based on results obtained with 22 different lots of phenothiazine, whereas conclusions drawn from any one trial can be based, at most, on 9.

Because in some trials changes in purity, fineness and "dose area" were not independent, the method of multiple regression analysis of grouped data has been used.

In the statistical analysis, the number of surviving worms in each sheep was replaced by its common logarithm and all numerical work was carried out using logarithms.

The basic equation is :—

$$Y = a + b_1 x_1 + b_2 x_2 + b_3 x_3$$

where Y = log of number of worms expected to survive the treatment,

a = log of geometric mean number surviving the average of the treatment used in the trial.

x_1 = difference between phenothiazine purity used in this treatment and the average purity for the trial.

b_1 = coefficient expressing the increase (decrease) in the log of the number of surviving worms expected for unit increase in phenothiazine purity.

x_2 = difference between phenothiazine fineness used in this treatment and the average fineness for the trial.

b_2 = coefficient expressing the increase (decrease) in the log of the number of surviving worms expected for unit increase in phenothiazine fineness.

x_3 = difference between the "dose area" used in this treatment and the average "dose area" for the trial.

b_3 = coefficient expressing the increase (decrease) in the log of the number of surviving worms expected for unit increase in phenothiazine "dose area."

TABLE II
TEST CONDITIONS AND RESULTS OF SERIES I
N.B.—*All worm counts are geometric means for the number of sheep stated.*

Sample	Purity per cent.	Fineness cm.² per g.	Dose rate (g)	Dose area cm.²	Number of sheep	Mean Worms remaining at *post-mortem*			
						Ostertagia	*T. axei*	*Trichostrongylus*	*Chabertia*
Control					16	2,028	1,738	11,140	73·0
A_1	79·7	8,600	15	129,000	4	701	372	1,730	7·4
A_1		8,600	24	206,400	4	545	366	379	1·5
A_2		12,900	9·4	121,260	4	280	193	2,880	33·0
A_2		12,900	15	193,500	4	321	586	2,997	3·4
Mean all dosages					16	431	352	1,543	6·0
B_1	86·5	7,900	15	118,500	4	1,030	865	2,617	1·7
B_1		7,900	24	189,600	4	151	142	631	2·6
B_2		13,000	9·4	122,200	4	452	262	1,869	6·5
B_2		13,000	15	195,000	4	44	81	227	2·5
Mean all dosages					16	237	226	915	2·9
C_1	87·8	8,200	15	123,000	4	224	181	966	1·1
C_1		8,200	24	196,800	4	46	63	267	0·8
C_2		12,600	9·4	118,440	4	60	195	1,846	15·2
C_2		12,600	15	189,000	4	22	119	130	0·6
Mean all dosages					16	61	127	498	1·7
D_1	99·7	8,500	15	127,500	4	798	443	3,604	4·3
D_1		8,500	24	204,000	4	140	154	1,136	1·8
D_2		13,600	9·4	127,840	4	340	342	1,024	2·2
D_2		13,600	15	204,000	4	73	200	1,148	1·5
Mean all dosages					16	230	261	1,481	2·2

TABLE III
TEST CONDITIONS AND RESULTS FOR SERIES II
N.B.—*Two sets each of 4 test sheep used for each treatment. All worm counts are geometric means for the number of sheep stated.*

Sample	Purity per cent.	Fineness cm.² per g.	Dose rate (g)	Dose area cm.²	Number of sheep	Mean Worms remaining at *post-mortem*			
						Ostertagia	*T. axei*	*Trichostrongylus*	*Chabertia*
Control					8	1,683	195	6,855	15·0
E	72·2	9,500	15	142,500	4	527	68	1,530	6·0
E	72·2	9,500	15	142,500	4	159	361	2,940	4·4
F	73·0	7,600	15	114,000	4	340	142	3,150	2·9
F	73·0	7,600	15	114,000	4	495	132	4,390	1·2
G	74·7	8,000	15	120,000	4	1,470	69	2,110	7·7
G	74·7	8,000	15	120,000	4	1,230	70	1,820	1·7
H	82·0	12,200	15	183,000	4	398	20	738	3·4
H	82·0	12,200	15	183,000	4	109	29	767	1·8
I	84·0	13,300	15	199,500	4	48	106	708	5·3
I	84·0	13,300	15	199,500	4	432	31	391	0·8
J_1	87·0	12,500	15	187,500	4	112	22	400	1·0
J_1	87·0	12,500	15	187,500	4	91	35	750	0·7

TABLE IV
TEST CONDITIONS AND RESULTS OF SERIES III
All worm counts are geometric means for the numbers of sheep stated.

Sample	Purity per cent.	Fineness cm.² per g.	Dose rate (g)	Dose area cm.²	Number of sheep	Mean worms remaining at *post-mortem*			
						Ostertagia	*T. axei*	*Trichostrongylus*	*Chabertia*
Control					8	991	2,030	4,140	2·9
K	80·5	10,900	15	163,500	4	369	267	1,708	2·5
L	81·8	10,400	15	156,000	4	75	295	1,396	1·1
M	83·5	11,600	15	174,000	4	107	313	664	0·8
N	85·5	11,800	15	177,000	4	107	213	638	0·8
O	85·9	9,600	15	144,000	4	268	627	657	1·0
J_1	87·0	12,500	15	187,500	4	114	298	513	1·5
P	87·9	11,600	15	174,000	4	37	159	696	1·9
Q	88·1	11,600	15	174,000	4	114	151	1,077	0·7
R	89·1	10,400	15	156,000	4	62	98	145	1·1

TABLE V
TEST CONDITIONS AND RESULTS OF SERIES IV
N.B.—*All worm counts are geometric means for the number of sheep stated.*

Sample	Purity per cent.	Fineness cm.² per g.	Dose rate (g)	Dose area cm.²	Number of sheep	Mean worms remaining at *post-mortem*			
						Ostertagia	*T. axei*	*Trichostrongylus*	*Chabertia*
Control					4	1,556	614	3,090	42·7
S_1	85	9,400	15	141,000	4	102	45	221	1·1
S_2	85	7,300	15	109,500	4	85	122	330	11·0
J_1	87	12,500	15	187,500	4	88	25	258	1·3
T	96	10,600	15	159,000	4	117	23	404	0·9

TABLE VI
TEST CONDITIONS AND RESULTS OF SERIES V
N.B.—*All worm counts are geometric means for the number of sheep stated.*

Sample	Purity per cent.	Fineness cm.² per g.	Dose rate (g)	Dose area cm.²	Number of sheep	Mean worms remaining at *post-mortem*			
						Ostertagia	*T. axei*	*Trichostrongylus*	*Chabertia*
Control					16	718	2,249	11,780	159·6
A_3	79·7	12,600	9·4	118,440	4	140	522	4,441	46·8
			15·0	189,000	4	412	627	6,800	22·6
A_3	79·7	12,600	9·4	118,440	4	546	720	5,991	22·4
			15·0	189,000	4	69	182	808	217·5
U_1	86·0	12,600	9·4	118,440	4	211	232	1,154	192·8
			15·0	189,000	4	89	470	2,089	17·6
U_2	86·0	12,000	9·4	112,800	4	48	329	1,641	137·3
			15·0	180,000	4	98	225	771	14·1
U_3	86·0	9,200	9·4	86,480	4	37	215	1,778	177·8
			15·0	138,000	4	44	214	582	12·3
U_4	86·0	11,200	9·4	105,280	4	61	285	250	11·5
			15·0	168,000	4	60	200	1,084	7·2
J_1	87·0	12,500	9·4	117,500	4	105	415	1,669	48·4
			15·0	187,500	4	302	419	1,558	17·7
J_2	87·0	12,100	9·4	113,740	4	94	192	1,531	19·6
			15·0	181,500	4	81	226	902	70·4
J_3	87·0	10,700	9·4	100,580	4	156	534	4,467	32·4
			15·0	160,500	4	271	282	832	48·1
J_4	87·0	11,800	9·4	110,920	4	264	320	1,189	69·2
			15·0	177,000	4	26	97	290	10·1

TABLE VII
TEST CONDITIONS AND RESULTS OF SERIES VI
N.B.—*All worm counts are geometric means for the number of sheep stated.*

Sample	Purity per cent.	Fineness cm.² per g.	Dose rate (g)	Dose area cm.²	Number of sheep	Mean worms remaining at *post-mortem*			
						Ostertagia	*T. axei*	*Trichostrongylus*	*Chabertia*
Control					6	1,233	432	1,954	225·9
F	73	7,600	9·4	71,440	3	1,109	97	2,265	111·5
		7,600	15	114,000	3	1,708	45	2,030	153·1
		7,600	24	182,400	3	136	106	313	40·0
Mean					9	637	78	1,128	88·1
V	82	11,400	9·4	107,160	3	260	174	162	193·8
		11,400	15	171,000	3	13	44	387	1·8
		11,400	24	273,600	2	150	23	79	17·1
Mean					8	79	56	170	18·2
W	91	2,300	9·4	21,620	3	54	77	1,809	128·0
		2,300	15	34,500	3	102	47	223	169·8
		2,300	24	55,200	3	13	29	804	41·7
Mean					9	41	47	686	96·8

Note: (1) The value of *a* is different for each of the 6 trials because the averages of the purity, fineness and dose area differed, and because the sheep and their worm infestations differed.

(2) The values of the *b* coefficients are the same for all trials because they are intended to show the general and unchanging effects of purity, fineness and "dose area."

In carrying out the statistical analysis sample W was omitted on the grounds that it would have required an unduly large correction for fineness. Subsequently, it was found to be in good overall agreement with the other data, but in bad agreement as regards the relative effects of coarse material on *Chabertia ovina* and *Ostertagia* spp.

The multiple regression analysis was extended to see if there were interactions between any pairs of the three factors—purity, fineness and "dose area." No interactions were found, and no other reference is made to this work.

The numerical results of the statistical analysis in terms of *a* and *b* coefficients are given in Table VIII and are used in drawing Figs. 1 to 4. In Table VIII the average value of *a* has been based on all sheep tested in order to get the most generally representative figure possible, and has been corrected so as to apply to standard conditions stated in the Table. In calculating percentages of worms surviving or killed the (geometric) mean for worms found in all control sheep has been used.

From the statistical analysis it was found that :—

(*a*) The effect of purity is significant at the 1/100 level and is essentially the same for all 4 species of parasites.

(*b*) The effect of "dose area" is significant at the 1/1,000 level and varies just significantly for different parasite species.

(*c*) The range of fineness used has no significant overall effect, but the effect is not the same for all parasites, the difference being significant at the 1/20 level.

(*c*) *Variability*

In experimental work of this nature the variability that can occur may be large. This can be seen by reference to Fig. 1.

If groups of 4 sheep, each group being of different origin, are dosed with different formulations of phenothiazine of the same purity and fineness, then we can expect the average percentage of surviving worms will be in the range from 0·27 to 3·7 times the value given by the formula in 19 out of 20 such groups. This is a range of 1 : 13·7 in percentage surviving worms.

Thus if the dose procedure is such that a kill of 94 per cent. is expected then the actual kill may be as high as 98·4 per cent., or as low as 87 per cent. If the treatment is less efficient and only an 80 per cent. average kill is expected, then the variability is greater and the average mortality may be as low as 26 per cent.

TABLE VIII
RESULTS OF STATISTICAL ANALYSIS

Standard conditions
Purity 85 per cent.
Fineness 10,000 cm.² per g. (by sedimentation)
Dose area 150,000 cm.².

Logarithm of per cent. of surviving worms

	Average all flocks at standard conditions a	Change for 10 per cent. rise in purity b_1	Change for 1,000 cm.²/g. rise in fineness b_2	Change for 10,000 cm.² rise in dose area b_3
Ostertagia spp.	1·135 (13·6%)	−0·204	−0·036	−0·030
T. axei	1·141 (13·8%)	−0·204	+0·012	−0·024
Trichostrongylus spp.	1·117 (13·1%)	−0·204	+0·012	−0·048
Chabertia ovina	1·028 (10·7%)	−0·204	+0·072	−0·050
All species of worms	1·122 (13·2%)	−0·204	omit	−0·038

Example : To estimate the efficiency against *Chabertia ovina* when using a 10 g. dose of material ground to a fineness of 12,500 cm.² per g. and having a purity of 85 per cent.

The dose area = 10 × 12,500 = 125,000 cm.².

The log per cent. surviving worms

$$= 1{\cdot}028 - 0{\cdot}204 \times \frac{\text{Purity per cent.} - 85 \text{ per cent.}}{10 \text{ per cent.}} + 0{\cdot}072 \times \frac{\text{Fineness cm.}^2 \text{ per g.} - 10{,}000}{1{,}000} - 0{\cdot}050 \times \frac{\text{Dose area cm.}^2 - 150{,}000}{10{,}000}$$

$$= 1{\cdot}028 - 0{\cdot}204 \times 0 + 0{\cdot}072 \times 2{\cdot}5 - 0{\cdot}050 \times (-2{\cdot}5)$$

$$= 1{\cdot}028 + 0{\cdot}180 + 0{\cdot}125$$

$$= 1{\cdot}333$$

By reference to Tables of antilogarithms the per cent. surviving worms is seen to be 21·5 per cent. and the expected mortality is 78·5 per cent.

There appear to be 4 components in variability.

(1) Variability between worm species within sheep .... $0_1^2 = 0{\cdot}3$

(2) Variability due to different mean infestations of sheep within a flock ... $0_2^2 = 0{\cdot}03$

(3) Variability between flock means ... $0_3^2 = 0{\cdot}02$

(4) Variability between different batches of phenothiazine having the same purity and specific surface area. (This includes also errors in some assumptions of linearity) ... $0_4^2 = 0{\cdot}03$

The variances are expressed as mean of logs of surviving worms.

Discussion

The conclusions from the 6 trials reported have been presented in Figs. 1 to 4. In Fig. 1 the mean percentage efficiency of a 150,000 cm.² dose of material has been plotted against the percentage purity after averaging for 4 parasites and correcting for differences between flocks. This figure shows the

effect of increase in purity, and also the variability encountered in this class of experimentation.

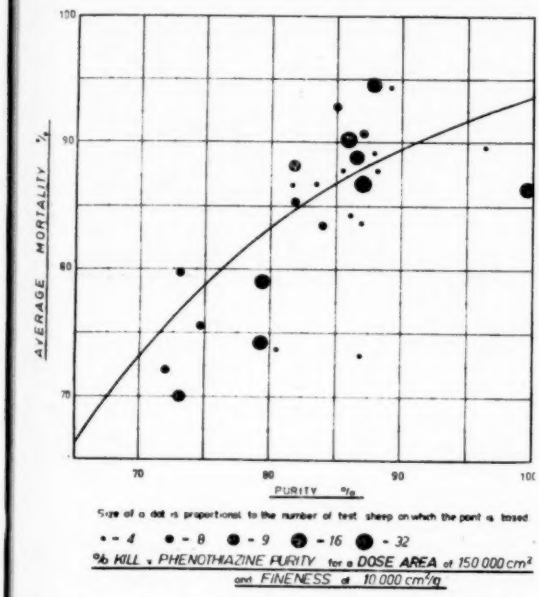
AVERAGE MORTALITY %
PURITY %
Size of a dot is proportional to the number of test sheep on which the point is based
• = 4 • = 8 • = 9 • = 16 • = 32
% KILL v PHENOTHIAZINE PURITY for a DOSE AREA of 150 000 cm²
and FINENESS of 10 000 cm²/g

FIG. 1.—The effect of phenothiazine purity at a " dose area " of 150,000 cm.² on the average percentage mortality of *all* species of worms.

For samples in which the purity was 85 per cent. or more, the efficiency was generally above 80 per cent. but when the purity fell below 80 per cent. the efficiency was always below 80 per cent.

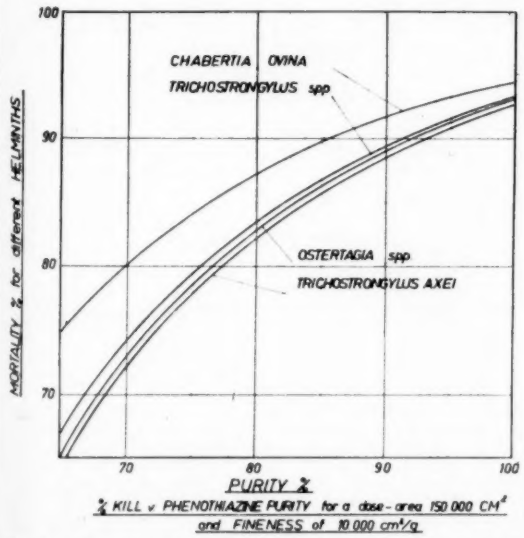
CHABERTIA OVINA
TRICHOSTRONGYLUS spp
OSTERTAGIA spp
TRICHOSTRONGYLUS AXEI
MORTALITY % for different HELMINTHS
PURITY %
% KILL v PHENOTHIAZINE PURITY for a dose-area 150 000 CM²
and FINENESS of 10 000 cm²/g

FIG. 2.—The effect of phenothiazine purity at a " dose area " of 150,000 cm.² on the average percentage mortality of *various* species of worms.

Douglas *et al.* (1959) and Baker *et al.* (1959) found that National Formulary phenothiazine (96 per cent. pure) was inferior to pure phenothiazine (100 per cent.). Our work, carried out over a wider range of purity is in general agreement with this, although we were unable to demonstrate such large differences in efficiency at the higher purity levels.

Fig. 2 shows that the effect of higher purity applies generally to all 4 types of parasites.

When individual species are considered the difference in susceptibility to phenothiazine is only slight. *Chabertia ovina* was the most easily killed. These findings differ from those of Douglas *et al.* (1956 and 1959) who considered that *Ostertagia* spp. and *T. axei* were more susceptible to phenothiazine than *Trichostrongylus* spp.

Figures 3A—3D indicate the importance of " dose area " for each of the 4 parasites when purity is held constant (85 per cent.). They also show the effect of fineness.

For *Ostertagia* spp. (Fig. 3A) the curve for the finer material is above the curve for coarser material, so that the use of finer material gives greater efficiency at the same " dose area." The improvement is even greater if the same dose weight of both materials is administered. For example, from Fig. 3A, 12 g. of 12,500 cm.² per g. give better results than 15 g. of 10,000 cm.² per g. (both " dose areas " 150,000 cm.²), but 15 g. of 12,500 cm.² per g. (185,000 cm.²) are better sti l.

For *T. axei* and *Trichostrongylus* spp. (Figures 3B and 3C) there appears to be no benefit from finer grinding at a given " dose area." However, for equal dose weights, finer grinding gives a greater dose area, and increased mortality.

For *Chabertia ovina* the effect of finer grinding is different (see Fig. 3D). The relative efficiencies of the same dose weights of material ground to different finenesses are shown in Table IX, and it appears that finer grinding is of no advantage against this species. Fine grinding is, however, very beneficial against *Ostertagia* spp. and the *Trichostrongylus* species.

TABLE IX
EFFICIENCY AGAINST *Chabertia ovina*

Dose g.	10,000 cm.² per g.		12,500 cm.² per g.	
	"Dose area"	Efficiency per cent.	"Dose area"	Efficiency per cent.
10	100,000	81·0	125,000	78·5
12·5	125,000	86·8	156,250	85·0
15	150,000	89·3	187,500	89·5
17·5	175,000	92·0	218,750	92·7
20	200,000	94·0	250,000	94·9

Fig. 4 summarises the situation by showing the effect, averaged over 4 parasite species of both purity and " dose area " on anthelmintic efficiency. For a 90 per cent. kill, which is believed to be near the economically desirable figure, a " dose area " of 185,000 cm.² is required for phenothiazine of 90 per cent. purity.

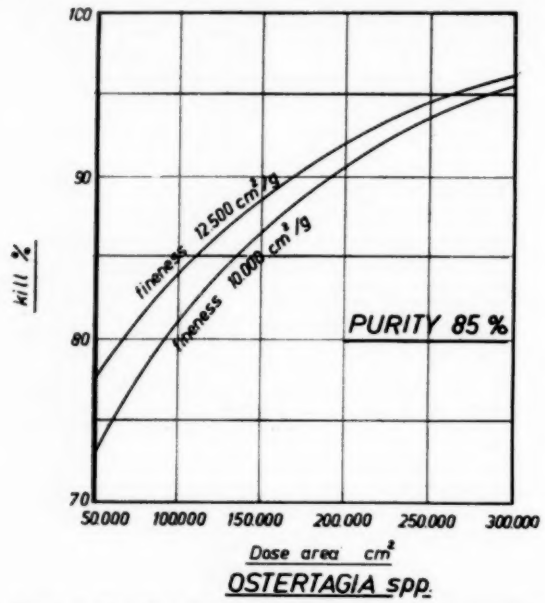

FIG. 3a.—The effect of " dose area " on the average percentage mortality of *Ostertagia* spp. using phenothiazine of 85 per cent. purity at two levels of grinding.

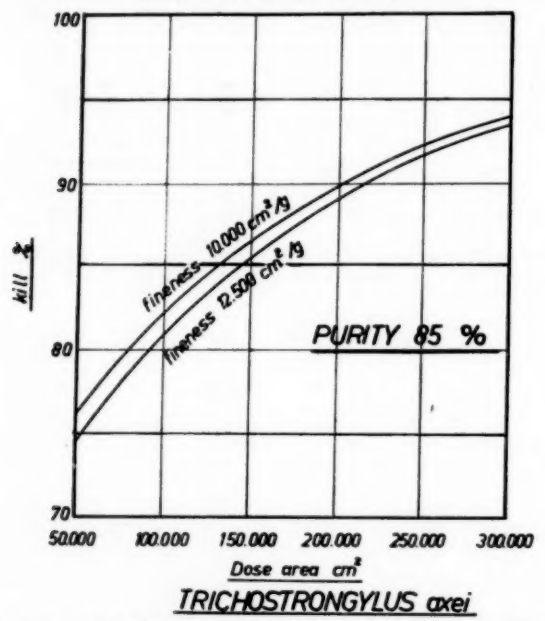

FIG. 3b.—The effect of " dose area " on the average percentage mortality of *Trichostrongylus axei* using phenothiazine of 85 per cent. purity at two levels of grinding.

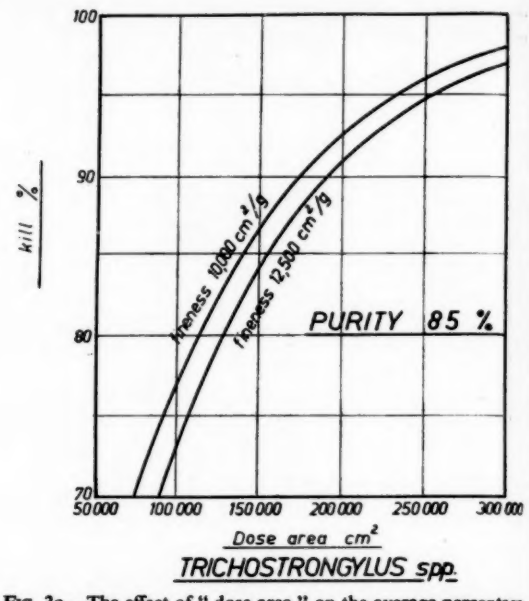

FIG. 3c.—The effect of " dose area " on the average percentage mortality of *Trichostrongylus* spp. using phenothiazine of 85 per cent. purity at two levels of grinding.

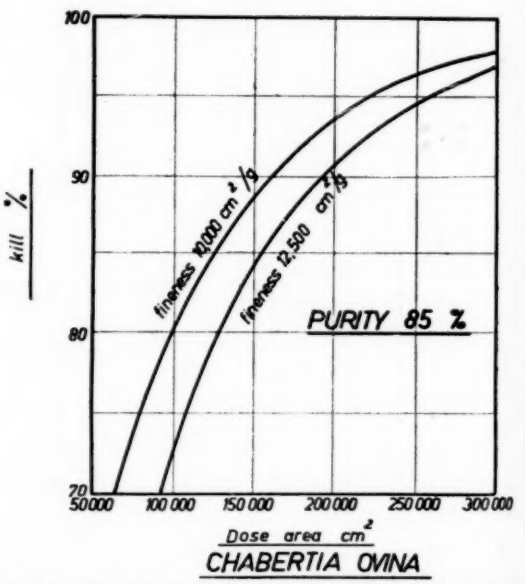

FIG. 3d.—The effect of " dose area " on the average percentage mortality of *Chabertia ovina* using phenothiazine of 85 per cent. purity at two levels of grinding.

Acknowledgments.—The authors wish to thank the Directors of ICIANZ Ltd., for the permission to publish these results and also Drs. J. A. Allen and S. F. Cox of ICIANZ Central Research Laboratories, Ascot Vale, and staff who carried out the preparation and analysis of the phenothiazine samples used in these trials. They are also indebted to Mr. G. Rogerson and Miss Beverley Todd, who assisted with the statistical analysis.

(*Concluded at foot of col.* 1, *page* 75)

Annotation

The Screw-worm in the Bahamas

BY

B. K. FENTON

Department of Agriculture, Nassau, Bahamas

SUMMARY.—The origin and habits of the screw-worm are described. The history of the screw-worm in the Bahamas shows the reason for concern by authorities in the neighbouring state of Florida where a successful elimination programme was recently completed. A description of the method of elimination, by using sterile flies, is followed by details of a recent survey of the fly population of the Bahamas. Mention is made of the type of trap used. The analysis of the catches suggests that there was no evidence of screw-worm fly infestation in the Bahamas.

Phenothiazine.—*Concluded.*

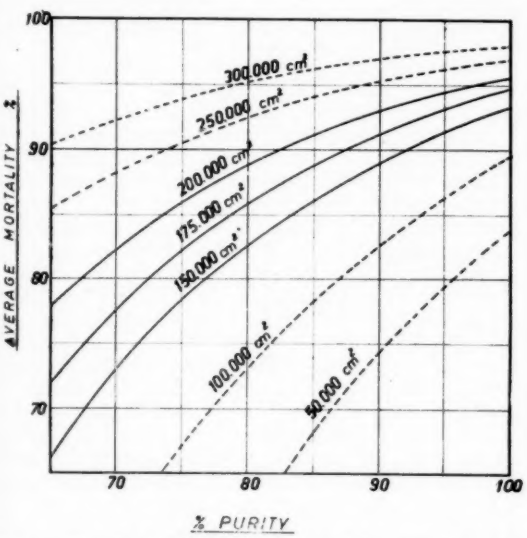

FIG. 4.—The effect of purity at various "dose area" on the average percentage mortality of all species of worms.

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Introduction

THE screw-worm is the larval stage of the flies *Cochliomya hominovorax* (syn. *C. americana*) and *Chrysomya bizziana*. These flies oviposit on most species of animals, and the larvae penetrate living tissues, producing a foul smelling exudate. Death is a common sequel to heavy infestations. Records show that in the Bahamas oviposition occurs mainly around the following sites:—

1. The mouth.
2. The ears, which are subject to constant re-infection after treatment.
3. The base of the umbilicus.
4. The vulval labii, particularly at the time of parturition.

History

The occurrence of screw-worm in the Bahamas was first recorded in May, 1943, following the importation of sheep from Cuba. The following July the screw-worm problem became so critical that advice was sought from the United States of America. During August the fly had invaded most of the principal island of New Providence, which is 21 miles long, and with a maximum width of 7 miles. It had not yet been found on any of the out islands of the Bahamas. Aided by an American adviser a campaign was organised and inspectors treated animals and instructed stock owners in the use of smear 62, a preparation containing diphenylamine, benzol, turkey red oil and lamp black, which effectively kills the larvae and protects wounds against re-infection. To avoid spread to the out islands all animals were examined before export was allowed.

The flock of 2,000 to which the imported sheep had originally been introduced suffered 41 cases. A table indicates how grave the situation was becoming:—

	Sheep	*Pigs*	*Horses*	*Cattle*
Examined	2046	230	34	30
Affected	59	65	10	3
Slaughtered	18	4		
Found Dead		2		

	Goats	*Dogs*	*Donkeys*	*Poultry*	*Cats*
Examined	30	6	5	1600	
Affected	6	3	2	1 rooster	
Slaughtered					
Found Dead		4			2

At the end of October the number of fresh outbreaks diminished and in December there were no known cases remaining. Since 1943 diverse reports

have been received and it was intimated that the screw-worm occurred on the island of Grand Bahama. Cases were reported as follows:—

	1944	*1945*	*1946*	*1947*
New Providence	3	–	–	–
Grand Bahama	–	–	2	2

	1948	*1949*	*1950*	*1951*	*1952*
New Providence	–	2	2	2	+++
Grand Bahama	–	2	–	some	++

It appeared that the situation in 1952 was gaining in seriousness, but experts were unable to identify the presence of screw-worm. Since then reports of its presence have waned to nil, and it is only recently that interest has been revived by the United States Department of Agriculture.

The American Interest

In 1938 Dove reported that the larvae of *C. hominovorax* were causing annual losses to the United States livestock industry of 10 million dollars. Twenty years later the U.S. Department of Agriculture estimated that Florida alone was losing this amount, whilst in the South Eastern states the loss had risen to a further 20 million dollars per annum. The seriousness of the situation encouraged research and it was found that the female screw-worm fly mates only once during its lifetime. With this knowledge it was predicted that the sterile matings would eventually eliminate the species.

Sterile male flies were produced by irradiating the 5½-day-old pupae with gamma rays from cobalt 60 for 10 minutes, long enough for them to receive a dose of 8,000 röntgen rays. The pupae were packed in cardboard boxes and 2½ days later the sterile flies developed; distribution was effected from the air when boxes were automatically opened and the dispersal rate was between 200 and 800 flies per square mile, depending upon the native fly population. Initial trials were made on the island of Curacao in 1954, when mass liberation at calculated intervals caused sterile matings and elimination of the fly. After several trials in the States a disused airport, at Sebring, Florida, was converted into a centre for the production of sterile flies. With the use of 40 tons of horse and whale meat, 4,500 gallons of blood, 9,600 gallons of water and 350 lb. of formalin, the sterile fly output rose to 50 million per week.

The programme went into full scale operation in July, 1958. Twenty aeroplanes were used on established flight patterns, each releasing 100 boxes of flies at an altitude of 1,500 feet and by November, 1959, the state of Florida was declared to be clear of the screw-worm fly.

Bahamas Survey

Due to the proximity of the Bahamas to Florida, the United States authorities requested permission to conduct a survey to ascertain whether or not the screw-worm still existed in these islands. The Bahamas Department of Agriculture agreed to co-operate and in conjunction with a team consisting of 2 veterinary surgeons and 2 entomologists, the survey commenced in August, 1959.

The survey was organised to cover the following major islands which are the chief centres of livestock production in the Bahamas:—

Andros, Abaco, Cat Island, Crooked Island, Eleuthera, Exuma, Grand Bahama, Inagua, Long Island, Mayaguana, New Providence and San Salvador.

Regular air services and chartered planes were used to distribute 46 wire fly traps at suitable locations. Each trap was baited with 1 lb. of fresh lamb liver and servicing was continued at weekly intervals for a period of 7 weeks. On New Providence servicing was necessary twice weekly because of the heavy catches, due no doubt to the more heavily populated areas. Flies were collected after treatment with pyrethrum, and traps rebaited with fresh liver. Catches were given a preliminary examination at the base in Nassau and then sent for final sorting at Sebring, Florida.

Type of Trap

The trap was collapsible, consisting of two steel hoops which formed the base and apex of a cylinder of 1/16 inch wire gauze. The measurements of the cylinder were 20 inches deep and 13½ inches diameter. The base of the cylinder was continued a further 16 inches below the metal hoop and tapered forming an inverted cone. By means of a piece of string it was possible to pull the cone upright inside the main cylinder of the trap, the base of the cone being attached to the base hoop of the cylinder. The apex of the cone had an opening 2 inches in diameter and flies developing from the eggs laid on the bait generally flew upwards and through the apical opening of the cone into the main cylinder of the trap, where they usually remained. Collection of catches was facilitated by eversion of the cone and by increasing the size of the apical opening by releasing a zip.

Attachment of a 6-inch-deep twin-handled bait dish of slightly smaller diameter than the trap was by means of 2 metal rods which were pushed through washers attached in the wire gauze just above the base hoop, through the handles of the dish and then through the washers on the opposite side of the trap. Suspension was by a triple rope attachment, the ropes passing through washers attached in the gauze just below the apical hoop.

Results of Survey

The analysis of the total catch was as follows:—

Callitroga macellaria	40 per cent.
Sarcophaga species	39 „ „
Lucilia species	8 „ „
Callitroga aldrichi	8 „ „
Musca domestica	3 „ „
Phormia regina	1 „ „
Chloroprocta idioidea	1 „ „

(*Concluded at foot of col.* 1, *page* 77)

Current Literature

ABSTRACTS

Bovine Mastitis with Findings of Yeast in the Udder Secretion. (Translated title). FUNKE, H. (1960). *Nord. VetMed.* **12.** 54.

Recovery of a number of species of yeasts in connexion with bovine mastitis has been reported during the last 10 years. During a 2-year period the author isolated yeasts from 21 milk samples sent in to his laboratory; the total number examined is not given but this presumably represents a very low incidence. However, the yeasts were recovered only on plates left at least 4 days, so that it is possible that other cases were missed. That the mastitis is due to the yeasts is suggested by the fact that pure cultures were isolated in most cases. Moreover the leucocyte content of the milk was related to the finding. Symptoms varied from acute with fever and inappetence to very mild localised reactions. No specific treatment is known.

The Screw-worm in the Bahamas.—*Concluded.*

On San Salvador, Inagua and Mayaguana there was a preponderance of *Callitroga aldrichi*—a fly generally associated with fish and limited to the lower tip of Key West in Florida. There were a few *Sarcophaga* and *Lucilia* spp. Some 60 to 70 per cent. of the trappings on Grand Bahama were *Lucilia* spp. and a few *Sarcophaga* spp. On Abaco, *Lucilia* and *Sarcophaga* spp. were mainly present, with a a few *C. macellaria.* The catch on Exuma consisted of 65 per cent. *C. aldrichi,* although on New Providence this fly only constituted 1 per cent. of the total. *Chloroprocta idioidea* was found only on Cat Island. This fly is not known to occur in Florida.

This survey, coupled with continued clinical examinations, indicates that the work done in counteracting the earlier invasion of the screw-worm fly was successful and that the Bahamas appears to be free from this most destructive parasite.

Acknowledgments.—The author would like to express gratitude for the help and encouragement given by Dr. G. Diamant of the United States Department of Agriculture, and Mr. O. S. Russell, Director of Agriculture, Bahamas.

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Examinations of Hens and Chickens at a Poultry Plant with a view to Findings of Salmonella Bacteria from the Cloaca. (Translated title). ELLEMANN, G. (1960). *Nord. VetMed.* **12.** 47.

Swabs from the cloaca of 2,081 hens, 649 chickens, and 105 cocks were taken, after slaughter, at a large poultry plant. Four cases of *Salmonella typhimurium,* 3 of *Salm. nilose,* 1 of *Salm. meleagridis,* and 1 of *Salm. krefeld* (an overall incidence of 0.3 per cent), were isolated. H. B.

Blepharoconjunctivitis in Turkeys. SANGER, V. L., MOORE, E. N., & FRANK, N. A. (1960). *Poult. Sci.* **39.** 482.

The authors describe a disease of the eyelid and eye of adult turkeys. It chiefly affects hens, and is more common in the winter months. Mortality is negligible, but morbidity may be up to 15 per cent.

Ulceration of the edge of the eyelid is followed by self-inflicted damage, giving extensive necrosis. Finally the eyelid becomes distorted by scar tissue. A conjunctivitis may develop into panopthalmia.

The cause remains unknown, but may be the micrococcus that was found in early lesions. Transmission experiments were negative. Streptomycin injections (250 mg. daily for 4 days) were helpful, but many birds recovered spontaneously when moved to warm houses. Contrary to earlier reports, vitamin A deficiency was not thought to be a causal factor.

E. A. G.

B_1 Hypovitaminose bei Entenkücken. B_1 Hypovitaminosis in Ducklings. ADAMAZTENEAU, I., & STANESCU, M. *Mh. VetMed.* **66.** 489.

These Hungarian authors describe the disease as occurring in 3- to 6-week-old ducklings, more often in the rapidly maturing breeds such as the Peking. The aetiology is seldom primary B_1 hypovitaminosis. Important factors are imbalance following heavy carbohydrate feeding, high demands of early development, the increased utilisation rate of vitamin B_1 at higher temperatures, and digestive disturbances involving intestinal and pancreatic organs. The result is a polyhypovitaminosis.

Symptoms: the nervous system is first affected, triggered off by exertion, increased heat or indirect sunlight. There is reduced muscular tone of the head and neck, and later, paralysis affects the legs and wings. When forced to run the affected animals collapse after a short distance. The appetite diminishes in some birds. Diarrhoea and constipation both occur. Simultaneously there are pathological heart and circulatory disturbances. The normal heart rate in the young bird of 1 to 2 weeks is about half that of the bird of 3 weeks which is about 480 to 600 per min. and very regular. The majority of sick ducklings die from heart failure following brachycardia. Differential diagnosis is briefly discussed. The course of the disease is variable and some sick birds may live a long time if conditions are not too adverse. Due to the loss of appetite growth ceases.

Prevention: balanced diet including adequate B

complex food-stuffs (yeast, green food, etc.). Treatment: ½ mg. B_1 for each young duckling gives an improvement after 24 hours though cardiac irregularities may continue for 2 to 3 days.

In experimental work ducklings 3 to 5 months old were kept on a beri-beri diet. Cardiograms showed that in sick birds there was a great variation of heart rhythm and rate. Brachycardia (to one-quarter of the normal rate), arrhythmia and very variable contractions were all noted. There are 7 diagrams to illustrate the cardiograms in this excellent paper.

A. D. W.

Bacteraemia in Pregnant Sheep Following Oral Administration of Vibrio Fetus. MILLER, V. A., JENSON, R., & GILROY, J. V. (1959). *Amer. J. vet. Res.* **20.** 677.

Ewes, 2 to 3 years of age from flocks which had no history of infection with *Vibrio fetus*, were given by mouth during their fifth month of gestation either 30 g. of freshly ground tissues from aborted lambs infected with *V. fetus* or 10 ml. of pooled broth cultures of *V. fetus*. Prior to oral inoculation and at a number of times during 46 days following inoculation, 5 ml. quantities of blood were removed from the jugular vein and cultured to determine whether or not *V. fetus* was present.

A *V. fetus* bacteraemia was demonstrated in 6 of 13 ewes inoculated with the infected tissues and in 32 of 49 ewes inoculated with cultures of *V. fetus*. The greatest incidence of bacteraemia occurred during the third day following inoculation. *V. fetus* was not found in any blood sample obtained after the fourteenth day following inoculation. H. W. S.

Polio-encephalomalacia of Sheep. HARTLEY, W. J., & KATER, J. C. (1959). *N. Z. vet. J.* **7.** 72.

A disease of sheep with a morbidity of about 5 per cent. and mortality of 100 per cent. is described. All ages are affected and the incidence is equal in both sexes.

Severely affected sheep are found lying on their sides showing nystagmus, absence of eye preservation reflex, opisthotonus, and intermittent colonic convulsions. Less severe cases became blind and "stargazed"; some of these cases recovered in 4 to 6 weeks.

Macroscopically, there were usually areas of yellow friable cortical grey matter in the cerebrum. Histological lesions were variable.

The cause of this condition is unknown.

Artificial Insemination of Sheep. MORRANT, A. J. (1960). *Aust. vet. J.* **36.** 230.

Describes in detail the method of semen collection from a ram which had lost the major portion of its penis in a shearing accident. Insemination from this ram produced an 85 per cent. lambing rate.

The Development of Resistance by Sheep to Infection with the Nematodes *Nematodirus fillicollis* and *Nematodirus battus*. GIBSON, T. E. (1959). *Brit. vet. J.* **115.** 120.

Evidence is presented which suggests that sheep over 6 months of age are resistant to the effects of infestation with *Nematodirus* spp., but that larvae are able to establish themselves. Development of the larvae was to some extent inhibited. Previous infestation appeared to produce no significant immunity.

Experimental Strongyloidiasis in Sheep and Goats. IV. Migration of Strongyloides papillosus in Lambs and Accompanying Pathologic Changes Following Percutaneous Infection. TURNER, J. H., SHALKOP. W. T., & WILSON, G. I. (1960). *Amer. J. vet. Res.* **21.** 536.

Larvae of *S. papillosus* were applied to skin in the inguinal region of sheep. Subsequent skin biopsies and blood samples taken before and samples of viscera taken after death, showed the life cycle of *S. papillosus* is similar to that of other *Strongyloides* spp. They penetrate skin and are carried by blood to the lungs where they break out of capillaries to pass to the small intestine *via* the trachea, oesophagus, and stomach. This cycle may occur in as little as 3½ days. Occasional larvae migrated to muscles.

Original infestation caused little skin damage but repeated applications of larvae caused intense pustular dermatitis.

Extensive haemorrhage was caused in the lungs during the migration but damage to the intestine was not severe. G. B. S. H.

Use of Griseofulvin in the Treatment of Ringworm. DONOVAN, E. F., BOHL, E. H. (1960). *Vet. Med.* **55.** 49.

This article commences by describing the mode of action of the antibiotic griseofulvin and continues with an account of its use in the treatment of 47 cats and 8 dogs, the observations covering a period of 5 months.

A positive diagnosis of ringworm was based on the appearance of fluorescent hairs using a Wood's light, culture of the fungus, and microscopic examination of hairs plucked from lesions.

Cultural methods showed 54 animals to be affected with *Microsporon canis* and 1 with a scropulariopsis species.

Affected animals were treated with griseofulvin in tablet form incorporated in the food at a dosage rate of 25 to 30 mg. per lb. bodyweight, the period of treatment being 11 to 21 days depending on the severity of the condition. At the conclusion of treatment all animals were given an antifungal bath after which a further examination of each patient was carried out under a Wood's light, and material from lesions examined microscopically and culturally for the presence of fungus. Clinical recovery was considered to have taken place when fluorescence could no longer be demonstrated and growth of new hair commenced. In dogs, pruritus and scaliness of lesions diminished 7 to 10 days after treatment commenced and new hair was seen after 15 days. In cats, scaliness became less after 10 days and new hair appeared 14 days after the commencement of treatment.

All but 2 animals responded to treatment within 11 to 21 days—these were young kittens which

showed little response in 35 days but a clinical cure was effected after a further 21 days treatment at an increased dose rate—both showed evidence of a blood dyscrasia.

The importance of clipping away infected hairs during treatment and the use of an antifungal bath once a cure is effected are discussed. L. R. T.

BOOK REVIEWS

Disease, Wastage and Husbandry in the British Dairy Herd, 1957-58. H.M.S.O., London (1960). 4s.

The most important statement in this booklet is that a survey for the following year is to be published. This survey should be made an annual project. It provides a great opportunity first to establish the factors influencing disease incidence and second to rate the success of any forecasts and preventive measures. It would also be a ready-made vehicle for any special investigations.

This is the first-ever country-wide picture of the incidence of the common diseases of dairy cattle. In the past reliable figures have been known only for the notifiable diseases ; even the report of the Economic Advisory Council in 1932 was based on 3 local surveys of milk-recorded herds and suffered from all the faults of local and stratified surveys.

This survey first analyses both nationally and by region (8 in all) the size and type of herd, breed, lactation and yield of cow, methods of husbandry, and various management practices such as seasonal calving pattern, method of mating, replacement policy, and S.19 policy. It then classifies the incidence of the most common diseases nationally and by region, size of herd, breed, lactation, and season. In future editions there should be some mention of the weather conditions prevailing throughout the year, together with any marked regional variation. Some rating, however wide, of the standard of nutrition of the herds, especially in March and April, should also be introduced. Information about culling is given and analysed to provide an estimate of the depreciation in market value of diseased cows. Inaccuracies of classification in the survey, especially of the genital diseases and digestive upsets, are discussed. These would probably be reflected in many a veterinary surgeon's case records.

Some of the associations and conclusions are questionable. Which occurs first, milk fever or dystocia ? Surely some if not all the factors causing a high incidence of the various metabolic diseases and bloat over relatively few farms are known to be associated with certain management practices ? Other associations require further elucidation. Is the higher incidence of hypomagnesaemia in Scotland related to less prophylaxis or some other feeding practice ? How much does brucellosis, especially the apparently normal cow excreting infection after a full-term parturition, affect the seasonal curve of abortions ?

At such a low price this booklet should be on the bookshelf of every mixed and large-animal practice in Great Britain as well as in every veterinary library. In a few years it and its successors should provide the basis for any intelligent discussion of disease control and play an important part in the formulation of policy and research. Does the incidence of Johne's disease warrant the wider use of vaccination ? As the average age of the national herd increases can we improve our diagnosis and prognosis of the diseases and disabilities of old age ? Could the mean age of the cow when culled and its value provide the rational basis for relating the importance of such genetic faults as udder shape to low yield ? Surely the incidence of foul-in-the-foot invites some investigation into the efficiency of methods of prevention. Surely the veterinary surgeon has a greater part to play in the field of undiagnosed infertility (2·96 per cent.) if only in pregnancy diagnosis, infertility diagnosis and prognosis.

May this survey soon stimulate similar surveys into the diseases of the other farm animals.

The Problem of Acute Hypothermia. Ed. P. M. STARKOV. Pergamon Press, Oxford (1960). 70s.

This book is a collection of papers on research recently carried out by a group of workers at the Kalinin Medical Institute, Omsk, U.S.S.R., and it represents without doubt the latest news from the Soviet Union on this important subject.

The publishers apologise for the format of the book —it is reproduced in photolitho from typescripts— but reasonably point out that the appearance of this work would have been delayed at least 6 months had it been set up in letterpress. They also apologise, very rightly, for the price which would seem to be out of all proportion to the size of the book. However, they say that it was produced without subsidy of any kind, and point out that the cost of translating and editing such a work in the shortest possible time is very great. The publishers have also voluntarily paid full authors' royalties in an attempt to elicit a reciprocal consideration from publishers in the Soviet countries.

Certain techniques of controlled hypothermia have been used in medicine for some years and have made possible some surgical operations which could otherwise not have been contemplated. If the body is cooled a few degrees below its normal level, the heart, for example, can be stopped for several minutes without fear of damage to it or to the central nervous system, on account of the reduced metabolic activity. Hypothermia is achieved by inhibiting the temperature regulating centre in some way, and when a condition of poikilothermia has been produced, the body temperature is reduced by cooling the skin. The situation is similar to hibernation. This book describes a number of experiments of fundamental importance concerning the technique and the physiological consequences of moderate and extreme cooling in experimental animals.

Implications of controlled hypothermia in medicine are enormous, a though it will interest the veterinarian only from the experimental angle. It is, like space travel and the creation of life, one of those science-fiction topics which have a compelling fascination for the Russians, and in which they demonstrably excel. This book, however, contains nothing of fiction ; not even the politico-philosophical tirades which were such a constant feature of Russian scientific literature after the war. The translation is in a plain, direct style and makes easy reading, although a little

imagination is needed with technical terms. The word " hexometonium," for instance, is more usually encountered as " hexamethonium." " Carbogen " is clearly carbon dioxide, but what " phenamine " is can be anybody's guess. It is a pity that more care could not have been taken over this one aspect.

This book is essential to anyone working on this subject of controlled hypothermia. It could be looked at profitably by physiologists with a passing interest in the subject. The work is, however, too detailed and the experimental results too particular for it to have any general interest.

British Poultry Standards. Poultry World, London (1960). 35s.

The first volume, dealing with breed standards, made its appearance in 1930 when the 4th World Poultry Congress was being held in London. It consisted of 240 pages and about 40 illustrations. Poultry World, however, who have published a very wide variety of texts dealing with all manner of poultry subjects, decided to publish in conjunction with the Poultry Club of Great Britain a much fuller version of the subject ; this came out soon after the 10th World Poultry Congress met in Edinburgh in 1954. This revised edition of British Poultry Standards is further enlarged, and now comprises 369 pages, 10 coloured plates, about 80 photographs of different breeds, and also a number of line drawings, dealing with points of a fowl, feather markings, legs, combs, eggs, etc.

The most important feature in the present volume is the inclusion of 6 new coloured plates covering over 40 different breeds. These are excellent, and the artist, Mr. R. A. Vowles, is to be congratulated on the faithful way in which he has depicted these many breeds. It is to be hoped that the diagram showing standard and faulty eggs (p. 342) will also be reproduced in colour whenever practicable. The adjacent sections deal with table poultry and dead table ducklings, but one feels that these could well be eliminated from what is otherwise a most excellent treatise, made the more so by a worthwhile 15-page glossary.

The reader may wonder perhaps why no reference is made to " hybrids " now that so many of these are playing such an important part in commercial egg production. But there are, of course, no breed standards for hybrids, indeed many vary so greatly in appearance it would be impossible to define their colours and markings easily. The fact that "hybrids" (now being produced by the million) have ousted many of the pure and crossbreeds, both for egg and broiler production, may well mean that this volume on breed standards will be the last the publishers can afford to market. A great pity indeed, if that is the case, because from the point of view of beauty and character, many of the breeds of poultry are irreplaceable. But the agricultural world to-day lives more by economics than aesthetics, and less and less interest will be disp ayed in pure breeds and their points in the future.

Achievement—Some Contributions of Animal Experiment to the Conquest of Disease. By GEOFFREY LAPAGE. Heffer & Sons, Cambridge (1960). 18s.

This is a rather unusual book, largely on account of the strictly impartial way in which the subject matter is presented. The author describes the more important experiments that man has done, either on himself or on other animals, and shows how these have contributed to present-day knowledge of methods used to cure or prevent many diseases of man and animals. Having presented this information the author deliberately leaves the reader to form his own conclusions as to whether man is justified in doing experiments on living animals and there is no discussion of this vexed question.

Presumably the book is intended more for the layman reader than for the members of the medical or veterinary professions. Nevertheless, many members of both professions will find it interesting to browse through a book that reminds them of the large part experiments have played in building up present-day knowledge. No doubt such readers will forgive some technical lapses found in the text.

There are two appendices dealing with the legal control of experiments on living animals and the breeding and care of laboratory animals.

The Blood Chemistry of the Dog and Cat. By FRANK BLOOM. Gamma Publications, New Work (1960).

This small book records the different techniques that can be used in estimating the levels of different chemicals present in the blood of the dog and cat. Chapters group these measurements under the following headings : Nitrogenous, Carbohydrates, Lipids, Inorganic Substances, Acid-Base Balance, Enzymes, Bile Pigments, Hormones, and Functional Tests.

The techniques for estimating each substance are preceded by a brief description of the part played by the substance in physiological processes. This is followed by the expected normal values and the pathological states that produce high or low values. There are over 100 references, mostly referring to the dog, and the full title of the paper is given.

This is a useful book for veterinary schools and hospitals, for laboratories that use the dog as an experimental animal, and for other centres that practice clinical pathology and wish to extend their techniques. The book is addressed to the small-animal veterinarian and the veterinary student but for them a larger book is indicated, in which the author should give the benefit of his experience on which tests have the greater practical value, what values should be considered as merely suspicious and what are plainly abnormal, and why some of these tests should be done on the blood instead of the urine.

" FERTILISER INFORMATION "

Members may like to be informed of this service which is put out by the Graham Cherry Organisation, of 41, Parliament Street, London, S.W.1. The service takes the form of a stencilled quarterly bulletin which is made available, free of charge on application, to those interested in agriculture and agricultural economics. A special feature is that the bulletin may be quoted from in speeches and papers, the copyright not being reserved.

Among the sub-titles of the last quarterly issue were *Fertilisers and Meat Production, Successful Grassland Management, Grassland Improvement by Fertiliser Treatment*, and other subjects likely to be of interest to veterinary surgeons in large-animal practice.

R.C.V.S Council Meeting

The quarterly meeting of the Council of the Royal College of Veterinary Surgeons was held in the Hall of the Law Society, Chancery Lane, W.C.2, on January 6th. The President, Mr. J. N. Ritchie, C.B., was in the chair.

Before the business of the meeting, Mr. G. N. Gould, J.P., senior Vice-President rose. He said he desired on behalf of the Council and, indeed, of the profession, to offer sincere congratulations to the President on the honour of Knighthood to be bestowed upon him by the Queen. It might be coincidental that the honour—rare in the veterinary profession—followed the Minister's announcement of completion of the scheme which marked the eradication of bovine tuberculosis in this country, a project to which the President dedicated himself very early in his professional career; "but it would, I am sure, be right to say" went on Mr. Gould, "that the great contribution which you have made to veterinary science and to the livestock industry in other spheres—not only in this country but in the international veterinary field—have also been recognised by this award." The Council were also very happy to see Mr. Ritchie restored to good health and undiminished activity in the affairs of the profession.

The President, in a brief response, thanked Mr. Gould for his remarks and members of Council for the way in which they had received them. He valued the honour very much indeed, and believed that it carried with it a considerable recognition not only of the work of the Animal Health Division in recent years, but also of the profession as a whole.

The President said it would have been noted that Dr. Wooldridge had been elected one of the first Fellows of Birkbeck College, London. The Governors had decided to institute Honorary Fellowships and Dr. Wooldridge's name appeared amongst a list of distinguished people so honoured. Council congratulated Dr. Wooldridge.

Obituary

Council stood in silence as a mark of respect to the memory of members of the Royal College who had died since the last meeting of Council.

Referring to the late Mr. George Harry Locke, who died on October 21st, 1960, Mr. H. Holroyd said that members would recall that Mr. Locke attended the previous meeting when many had the pleasure of seeing him. Mr. Holroyd's family and that of Mr. Locke had been very great friends for many years, and Mr. Locke was a practitioner who would long be remembered in Manchester. His father had been a veterinary surgeon as was his son, and there was now a grandson in the profession.

The late Mr Locke was President of the Royal College in 1934, and he served the Council for 20 years during the period 1920 to 1940. He was a gentleman who was active in many spheres, and was always ready to help anybody. He did a great deal of work for the National Benevolent Society in Manchester, and his loss would be mourned.

Reports of Committees

The minutes of meetings of Committees were then presented.

The Examination and Education Committee

This committee sat on January 5th and the following points from its deliberations are of general interest. The first examination for Meat Detention Officers in Northern Ireland had been held, and Professor H. G. Lamont, chairman of the committee said that it was attended by representatives from the Ministry of Health, the Royal Society of Health, and the Department of Agriculture for Scotland, all of whom reported very favourably indeed on the standards set out by the Royal College. It was noted that further examinations would be conducted when required.

It was recommended that Professor C. W. Ottaway be invited to give the Share-Jones lectures for 1961.

Mr. P. H. Lamont who had recently had a thesis approved by the University of Cambridge for the degree of Ph.D. had written to the Registrar to say that most of the work contained in his thesis had been done during his tenure of the Sir Frederick Smith Research Fellowship. Mr. Lamont thanked the Royal College for the help they had given him. The report of the Committee was adopted by the Council.

The Finance and General Purposes Committee

This committee had sat, under the Chairmanship of Mr. A. J. Wright, on January 4th. Apart from a number of matters of purely domestic interest to the Royal College it was reported that arrangements for the annual general meeting and the meetings of Council to be held in Edinburgh on June 7th, 8th and 9th had been made. On the morning of the first of these days the authorities of St. Giles had consented that the College service should be held there. This would be followed by the annual luncheon at the George Hotel, with the annual general meeting thereafter at the Royal (Dick) School of Veterinary Studies, by permission of the Director.

Suggestions had been made to the Royal College that the use of limited companies might be of financial advantage to members in practice in the legitimate easing of the incidence of taxation. The Council resolved that the Preliminary Investigation and Advisory Committee be asked to review the matter and report back.

A memorandum had been received from the Association of Veterinary Teachers and Research Workers (Southern Region) on the question of patenting as it applies to veterinary surgeons, particularly those engaged in research. Council decided that this matter should be considered by a sub-committee.

The Library Committee

This committee, under the Chairmanship of Professor E. G. White, had met on January 4th.

The librarian reported verbally on the removal of

(*Concluded at foot of page overleaf*)

News and Comment

N.F.U. PRESIDENT ON FOOT-AND-MOUTH DISEASE

In making the Presidential address to the annual meeting of the National Farmers' Union held in the Central Hall, London, last Monday, Mr. Harold Woolley, C.B.E., said:—

"Foot-and-mouth disease has been prevalent, causing heavy financial loss involving compensation which may well amount to over £2 million this year. It is disturbing, to say the least, that our farmers are subjected to continual outbreaks of this disease when the evidence indicates that the country could be largely protected from infection were it not for the importation of the virus in meat from South America.

"On the brighter side of this problem of animal health, 1960 has seen the completion of a campaign to eradicate bovine tuberculosis from the herds of this country. The eradication campaign has been completed in a period of ten years, an achievement which none of us engaged in the original planning of the campaign really thought possible.

"We have discussed with the Government the means whereby the fight against animal disease can be carried further forward and we welcome the decision to make a major attack upon swine fever and contagious abortion."

THE B.S.A.V.A. CONGRESS

This congress, which is to be held at the Kensington Palace Hotel, London, W.8, from April 20th to 23rd has, as usual, a number of novel and interesting features. From a preliminary look through the provisional programme it promises to be of considerable interest.

The major novelty this year is the "Transatlantic Link" between a panel of British small-animal specialists and a corresponding United States panel. At each end of the "link" will be large photographs of the opposite team, and whenever a member of the team is speaking the photograph will be illuminated, so that audiences will know who is speaking. Conversation will be relaid to and fro across the Atlantic by wireless telegraphy, and each team will present a clinical case for general discussion which will be relayed to the audience by loudspeaker.

Another novelty is that the B.S.A.V.A. intend this Congress to have a strong international flavour, and 11 distinguished foreign veterinarians will present papers. The programme for the first day includes an evening meeting of the World Small Animal Veterinary Association, whose honorary secretary is Mr. W. Brian Singleton.

The keynote of the papers is to be surgery and conditions of the eye, and a number of authors will

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R.C.V.S. Council Meeting.—*Concluded.*

the Memorial Library to a large single room in College House. Every effort was being made to resume as soon as possible the library services to members. The committee expressed its warm appreciation of the work carried out by the librarian and her clerical assistant. It was resolved that the thanks of the committee to the librarian be recorded.

Arising out of the librarian's report, the committee discussed its functions particularly in relation to the planning and design of the new Memorial Library. It recommended that the chairman of the Library Committee should be a member of the building sub-committee.

The Parliamentary Committee

Professor W. L. Weipers, the chairman, presented the Minutes of this committee which had met on January 4th. Several matters of considerable general importance were included. It was resolved that the committee would welcome discussion at the Parliamentary and Scientific Committee on meat inspection. It was suggested that a memorandum be prepared for submission to the President and the chairman of the Parliamentary Committee before presenting the facts on this subject to the Parliamentary and Scientific Committee. Council wished the matter to be kept under constant review with the B.V.A.

On the subject of animal nurses, a report of a meeting between the Officers of the Royal College and the Officers of the B.V.A. had been presented to the meeting of the Parliamentary Committee. The scheme for animal nurses would be put into effect by the College in the New Year, after a discussion with the B.V.A's liaison committee. The title of the proposed workers should, for the time being, be Veterinary Nursing Auxilliary.

The Officers of the B.V.A. had asked the College to consider the matter of witnesses' fees in Crown proceedings and had forwarded a memorandum. The College Council decided to instruct its Registrar to make contact with other professional bodies on this subject.

Other Business

The President said that the Royal College owed a debt of gratitude to the Council of the Law Society for permitting the R.C.V.S. Council to meet in its premises, and for allowing them to use the Council Suite for meetings.

He also desired to record thanks on behalf of the Council to Mr. Greenough for having made such an interesting film of the Royal College's former premises, and to the Wellcome Foundation for having provided facilities for showing the film and for hospitality.

Finally, the move itself had been a considerable undertaking and he desired to move a vote of thanks to the staff of the College for the way in which it had been carried through. A great deal of work had been involved in moving the ordinary material, and particularly in moving the contents of the library, which was virtually ready to function already.

be speaking on this subject; but also of practical value will be the "refresher courses" which comprise much of the first day's programme, and also 2 lectures on the organisation of individual practices.

A little later on, when the programme is finalised, we hope to publish it in detail.

CLASSIFIED ADVERTISEMENT RATES

At its meeting last Friday, Council approved a recommendation from the Editorial Committee that rates for classified advertisements in THE VETERINARY RECORD should be increased moderately. The clerical work involved in these advertisements is quite out of proportion to the income, and even the new rates will be considerably lower for our members than those in comparable journals. A revised chart, based on that which appears on advertisement page XXVII of this issue will be published on February 25th; as the new rates will operate from our issue of March 4th.

THE ROYAL COLLEGE OF VETERINARY SURGEONS

The undermentioned graduates were admitted to membership of the Royal College on December 16th, 1960, in virtue of the registrable degree of B.V.M. & S. of the University of Edinburgh:—

Calvert, David John, Glen Eden, Hartley, Kirkby Stephen, Westmorland; Gardner, Edward Albert, 19 Vandeleur Avenue, Edinburgh, 7; Goodman, Alan Philip, 11 Round Road, Erdington, Birmingham, 24; Harrison, Richard Dex, 47 Booth Street, Cleckheaton, Yorks.; Lowe, William Alistair, 1 Beulah, Musselburgh, Midlothian; McIlveen, Samuel Walter Dermot, 26 Derryvolgie Avenue, Belfast, 9; Radley, David Ewart, 31 Smithy Lane, Skelmanthorpe, nr. Huddersfield, Yorks.; Searles, Patricia Anne (Miss), Thodys, Alresford, Hants.; Seckington, Ian Michael, 5 Byland Place, Westlands, Newcastle, Staffs.; and Wilkinson, Ian Speed, 14 Emerson Avenue, Linthorpe, Middlesbrough, Yorks.

The undermentioned graduates were admitted to membership of the Royal College on January 7th, 1961, in virtue of the registrable degree of B.Vet.Med., of the University of London:—

Baker, Michael William, 45 Joy Lane, Whitstable, Kent; Barber, Kenneth William, 91 Strawberry Vale, Twickenham, Middx.; Berry, Allan Philip, Max Gate, 234 Maidstone Road, Chatham, Kent; Bleby, John, 35 Kirkley Park Road, Lowestoft, Suffolk. Captain, R.A.S.C. (A.E.R.); Bourne, Frederick John, Hilbury, Longdon Hill, Evesham, Worcs.; Callaghan, John Barrie, 6 Pen Street, Boston, Lincs.; Cartwright, Jonathan Richard, Somerfield House, 296 Warwick Road, Alton, Solihull, Warwicks.; Chambers, John Clive, 559 Felixstowe Road, Ipswich, Suffolk; Crossley, John Francis, "Woodside," 141 Bradbourne Park Road, Sevenoaks, Kent; Davies, Anthony Baumann, Iscoed, Llandybie, Carmarthen; Doncaster, Robert Antony, 5 Mill View, Waltham, Grimsby, Lincs.; Elliott, Donald Arthur, 9 Laurel Avenue, Potters Bar, Middx.; Esplen, William Brian, Roxburn, Mizen Close, Cobham, Surrey; Evans, David Evan Gwenog, Bryn, North Road, Lampeter, Cardigans.; Evans, Keith, 93 Heol Emrys, Panlan, Swansea, Glam.; Featherstone, David John Lee, St. John's Vicarage, Surrey Road, Bournemouth, Hants.; Foord, Henry Edward, c/o 65-67 Grenfell Road, Maidenhead, Berks.; Fraser, Hugh, Little Oakwood, Idle Hill, Sevenoaks, Kent; Hails, Susan Patricia (Mrs.), 110 Gloucester Court, Kew Road, Richmond, Surrey; Harris, John Douglas, Bwrw House, Bwrw Lane, Loughor, Swansea, Glam., S. Wales; Hill, Frederick William Graham, 34 Arthur's Avenue, Harrogate, Yorks.; Hill, Valerie Alison (Mrs.) (*née Manning*), 10 Holmsley Close, New Malden, Surrey; Hoad, Malcolm John, 431 Brentwood Road, Romford, Essex; Hogger David George, Willow-Lawn, Hempsted, Gloucester; Jones, Keith Rowland Morgan-, 295 Crofton Road, Orpington, Kent; Kally, Uziel, P.O. Box 81, Rehovot, Israel; Lewis, Roger David, c/o "Doiran," Clarbeston Road, Pembs.; Manning, Valerie Alison (Miss) (*see* Hill, Mrs. V. A.); Moore, Bryan Michael, 47 Chaldon Common Road, Chaldon, Caterham, Surrey; Noakes, David Ernest, 34 Greenfield Road, Whitchurch, Cardiff; Pilling, Lionel John Christopher, Poynton House, Shropshire Street, Market Drayton, Salop.; Potter, William Richmond, 7 Hebron Road, Linthorpe, Middlesbrough, Yorks.; Quest, John Averill, 26 Chestwood Avenue, Sticklepath, Barnstaple, N. Devon; Redfern, David Michael, 208 Winstanley Drive, Leicester; Robertson, David Gilbert, 44 Waddington Way, London, S.E.19; Shaw, Richard Carter, Church View, St. Andrew's Street, Kirton Lindsey, Gainsborough, Lincs.; Smith, Dennis Leonard, 1 Malting Cottages, Braughing, nr. Ware, Herts.; Sutton, Douglas Michael, 1 Highfield Road, Newbury, Berks.; Swainston, John Jerome [illegible] Cottage, Chastleton, Moreton-in-Marsh, Glos.; T[illegible] Christopher John, Shotters Farm, Lickfold Green, [illegible]rth, nr. Petworth, W. Sussex; Tribe, Howard Arthur, 792 Romford Road, Manor Park, London, E.12; Unwin, David Dudley, Purley Gardens, Purley, near Reading, Berks.; Woode, Gerald Nottidge, 7 Clovelly, Marine Parade, Littlestone, nr. New Romney, Kent; and Woodward, Brian George, 5 Strathmore Gardens, Edgware, Middx.

THE R.C.V.S. LIBRARY

We are asked by the Librarian to explain that because of the recent removal from 10 Red Lion Square, which took place at a time of staff shortage, the library service has, temporarily, not been able to function at full efficiency. Every effort is being made to get back to normal working as quickly as possible, and all current enquiries are being dealt with as promptly as circumstances allow.

PERSONAL

Mr. Kenneth J. Garnett has successfully completed the Postgraduate Diploma in Tropical Agriculture (D.T.A. (Trin.)), at the Imperial College of Tropical Agriculture in Trinidad.

He is believed to be the first veterinarian with no previous agricultural qualifications to be accepted for this course.

Mr. H. I. Field, Deputy Director of the Central Veterinary Laboratory, left on January 22nd to spend 8 weeks in the U.S.A. and Canada. The first 6 weeks will be spent in the U.S.A., and arrangements have been made for him to visit the following State universities: Missouri, Nebraska, California, Cornell, Washington, Wisconsin, Minnesota, Illinois, Michigan and Ohio. He will also meet members of the United States Department of Agriculture and will visit their Agricultural Research Centre at Beltsville, the National Institute of Health, Bethesda, and the Communicable Disease Centre at Chamblee.

The 2 weeks in Canada will be spent visiting veterinary institutes and colleges in the Toronto, Ottawa and Montreal areas. These include the Animal Research Institute, Ottawa and the Ontario Veterinary College at Guelph.

Mr. T. Hughes Ellis, F.R.C.V.S., has been elected a Fellow of the Institute of Directors.

Engagements

DAVIES—GIDMAN.—The engagement is announced between Hugh Emlyn Davies, B.V.SC., M.R.C.V.S., son of the late Ben Davies, M.R.C.V.S., and Mrs. Davies, of Walsall, and Suzanne, elder daughter of Mr. and Mrs. D. Gidman, of Westbury-on-Trym, Bristol.

Births

THORNTON.—On January 18th, 1961, to Dorothy Le Patourel, wife of David A. K. Thornton, B.VET.MED., M.R.C.V.S., Manor Farm, Bighton, Alresford, Hants., a son, Robert Kennedy, a brother for Mary-Jane.

COMING EVENTS

January

30th (Mon.). EAST YORKSHIRE CLINICAL CLUB. Meeting at the Talbot Hotel, Malton, 8 p.m.

February

1st (Wed.). DUMFRIES AND GALLOWAY DIVISION. Meeting in the Queensberry Arms Hotel, Arran, 2.15 p.m.

WESTERN COUNTIES VETERINARY ASSOCIATION. DEVON BRANCH. Meeting at the Tavistock Golf Club, Tavistock, 7.30 p.m.

B.S.A.V.A. REGION 3. A Meeting at The Canine Health Centre, Animal Health Trust, Kennett, Nr. Newmarket, 2.30 p.m.

2nd (Thurs.). WEST OF SCOTLAND DIVISION—CLINICAL CLUB. Meeting at the University Veterinary School, 83 Buccleuch Street, Glasgow, C.3, 7.30 p.m.

CENTRAL VETERINARY SOCIETY. Ordinary General Meeting at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

4th (Sat.). B.S.A.V.A. SOUTHERN COUNTIES REGION. Meeting at the Royal Hotel, Winchester, 6.30 p.m.

7th (Tues.). 12th Anniversary Dinner-Dance of the University of Bristol Centaur Society at the Berkeley, Bristol.

8th (Wed.). SUSSEX VETERINARY SOCIETY. Ordinary General Meeting at the Dudley Hotel, Lansdowne Place, Hove, 2.30 p.m.

SCOTTISH METROPOLITAN DIVISION. Annual General Meeting at the Royal (Dick) School of Veterinary Studies, 2.30 p.m.

THE CAMBRIDGE SOCIETY FOR THE STUDY OF COMPARATIVE MEDICINE. Meeting in the Lecture Theatre of the School of Veterinary Medicine, Madingley Road, Cambridge, 8.30 p.m.

SOUTHERN COUNTIES VETERINARY SOCIETY. Meeting at the Polygon Hotel, Southampton, 7.30 p.m.

9th (Thurs.). Annual Ball of the Royal (Dick) School of Veterinary Studies in the Assembly Rooms, George Street, Edinburgh, 9 p.m.

SOCIETY FOR THE STUDY OF ANIMAL BREEDING. 9th Annual General Meeting at the Royal Society of Medicine, 1 Wimpole Street, W.1, 10.30 a.m.

ESSEX VETERINARY SOCIETY. Meeting at the George Hotel, Colchester, 7.30 p.m.

10th (Fri.). YORKSHIRE VETERINARY SOCIETY. Annual General Meeting at the Metropole Hotel, Leeds, 2.30 p.m.

ASSOCIATION OF VETERINARY FOOD HYGIENISTS. Meeting at the Corporation of Birmingham Abattoir, New Street, 2 p.m.

15th (Wed.). SOUTH EASTERN VETERINARY ASSOCIATION. Annual General Meeting at the Royal Star Hotel, Maidstone, 7.30 p.m.

22nd (Wed.). SUSSEX VETERINARY SOCIETY. Joint Meeting with the local Division of the B.M.A. preceded by dinner at 7 p.m.

EASTERN COUNTIES VETERINARY SOCIETY. Winter Meeting at the Bell Hotel, Norwich, 12 noon.

March

9th (Thurs.). V.V.B.F. NORTH OF SCOTLAND DIVISION. Annual Dinner and Dance in the Northern Hotel, Aberdeen, 7.30 p.m.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Carmarthens. Ffrwd Vale Mill, Crugybar, Llanwrda (Jan. 17).
Derbys. Lea Wood Farm, Snitterton, Matlock (Jan. 18).
Devon. North Hayne Farm, Shillingford, Tiverton (Jan. 23).
Dorset. Peckons Hill Farm, Ludwell, Shaftesbury (Jan. 20).
Inverness. Annat, Braeroy, Roybridge (Jan. 20).
Lanark. Plymuir Farm, Uplawmoor, Neilston, Glasgow (Jan. 19).
Perth. Cattle Court, Arngask Farm, Glenfarg (Jan. 17).
Salop. Grindley Brook Farm, Whitchurch (Jan. 18).
Sussex. Bowders Farm, Balcombe, Haywards Heath (Jan. 23).
Warwicks. East Chase Farm, Chase Lane, Kenilworth (Jan. 19).

Fowl Pest

Berks. 12 The Croft, East Hagbourne, Didcot (Jan. 17); Handpost, Swallowfield, Reading (Jan. 18); 4 Harwood Road, East Hagbourne, Didcot (Jan. 20).
Bucks. Bridgeway Poultry Farm, Aston Clinton, Aylesbury (Jan. 17).
Essex. Langford Lee, Maldon Road, Langford, Maldon (Jan. 19); Loftmans Farm, Steeple, Southminster; The Willows, Crookswell Green, Writtle, Chelmsford (Jan. 20); Wellington Farm, Cooks Mill Green, Writtle, Chelmsford (Jan. 21); Southfields, Althorne, Chelmsford; 1 Pilcox Lane, Tendring, Clacton-on-Sea (Jan. 23).
Hants. Scotland Farm, Ash Vale, Aldershot (Jan. 18); Ridgeway, Lymington (Jan. 22); Lowsley Farm, Liphook (Jan. 23).
Herts. Three Horse Shoes, West Road, Sawbridgeworth (Jan. 21); Bucketts Land Farm, Well End, Barnet (Jan. 22).
Lancs. Rosehill, Leyland Lane, Ulnes Walton, Preston (Jan. 22); Moor Hall Farm, Bartle, Preston; Homestead, Rosemary Lane, Bartle, Preston; Woodville, Shawgarve, Euxton, Chorley (Jan. 23).
Kent. West Wood Farm, Southfleet, Gravesend (Jan. 22).
Norfolk. The Mermaid Inn, Elsing, Dereham; White House Farm, Haveringland, Norwich (Jan. 17); Town Farm, Wingfield, Diss; Brickyard Farm, Hevingham, Norwich; Pagoda Farm, Hevingham, Norwich (Jan. 18); Street Farm, Pulham Market, Diss; The Poplars, Main Road, Rollesby, Great Yarmouth; Hungate Farm, Aylsham; Willows Farm, Marsham, Norwich (Jan. 19); High House, Bressingham, Diss; Mead Lodge, Buxton, Norwich; Little Dyke Beck Farm, Wymondham; Whitehouse Farm, Marsham, Norwich; Tollshill Bungalow, Wroxham Road, Rackheath, Norwich (Jan. 20); Lamberts Farm, Marsham, Norwich; Galls Farm, Marsham, Norwich; 6 Pumps Corner, Marsham, Norwich; Main Road, Rollesby, Great Yarmouth; Pine Lodge Farm, Marsham, Norwich (Jan. 21); Sharpes Hall Farm, Horsford, Norwich; Top Farm, Marsham, Norwich; Dale Farm, Holt Road, Hevingham;

202 Fakenham Road, Taverham, Norwich; 21 Holman Road, Aylsham, Norwich; Glenview, Hempnall, Norwich; St. Margarets, Wood Lane, Swardeston, Norwich; Heath Farm, Hevingham; College Farm, Happisburgh, Norwich (Jan. 22); 176 High Road, Drayton, Norwich; Fair View, Holt Road, Felthorpe, Norwich; Fengate, Marsham, Norwich; The Bungalow, Bungay Road, Hempnall, Norwich; 97 Drayton High Road, Drayton; Primrose Farm, Witton Bridge, Norwich; 105 Fakenham Road, Taverham, Norwich; Saikband, Holt Road, Felthorpe, Norwich; Home Farm, Hempnall, Norwich (Jan. 23).

Suffolk. Firsfield, Bardwell, Bury St. Edmunds; Halesworth Road, Reydon, Southwold (Jan. 19); White House Farm, Mendlesham, Stowmarket; Hill Farm, Kettleburgh, Woodbridge; Brownshill and Cawston Allotments, Earl Soham, Woodbridge (Jan. 21).

Surrey. Baldwins, Fernhurst, Haslemere (Jan. 20); Hoggshill Farm, Fernhurst, Haslemere (Jan. 21).

Sussex. Balchins Farm, Strood Green, Wisborough Green, Billingshurst (Jan. 17); Leggatt Hall Farm, Lodsworth, Petworth (Jan. 20).

Yorks. Whiston Hall Farm, Whiston, Rotherham; Whiston Hall, Whiston, Rotherham (Jan. 19).

Swine Fever

Essex. Heath Farm, Orsett Heath, Grays (Jan. 17); The Piggeries, Pole Lane, White Notley, Witham (Jan. 20).

Flints. Cae March, Soughton, Mold (Jan. 17); Shepherds Cottage, Cornist, Flint (Jan. 23).

Hants. Piggeries, Manor Farm, Thruxton (Jan. 20).

Lancs. Schofield Farm, Wolstenholme Fold, Norden, Rochdale (Jan. 17).

Lincs. Midville House Farm, Midville, Stickney, Boston (Jan. 17).

Norfolk. Denton Lodge, Denton, Harleston (Jan. 20).

Staffs. The Bungalow, Heatley, Abbots Bromley, Rugeley (Jan. 23).

Suffolk. Rockylls Hall, Shelland, Rattlesden, Bury St. Edmunds (Jan. 17); The Allotments, Cherry Tree Farm, Mendlesham, Stowmarket (Jan. 20); The Gables, Aldham, Ipswich (Jan. 23).

Surrey. France Farm, Longrcross, Chertsey (Jan. 17); Piggeries Scotshall Lane, Chelsham, Warlingham (Jan. 20).

Yorks. Threappleton Farm, Wyke Lane, Wyke, Bradford (Jan. 17); Home Farm, Scorton, Richmond (Jan. 20); Mill Farm, South Otterington, Northallerton; Green Farm, Seaton Ross (Jan. 23).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Some Sprightly Seniors

Sir,—Veterinary surgeons of the horse age had to be tough.

A short time ago I sent you a note about Tom Hicks and his remarkable record as a songster. I have received news of two other worthies. One was Tom Hicks's contemporary at college; they lived together so their landlady must be given some credit. The other is their senior by 3 years. I refer to Charles Townsend, of Long Stanton, who is in his 80th year, and to Jack Poles of Whittlesey, who is in his 83rd year. These two remarkable men are still following hounds and quite recently they rode home together after a day with the "Fitzwilliam." I think that such an incident must be almost unique in veterinary history.

I know of quite a number of veterinary surgeons who have hunted when of great age. Mr. Sparrow, of Chelmsford, was nearly 90 when he dismounted and then only because of a failure of eyesight. Let us hope that our two vigorous octogenarian veterinary surgeons may have many more years of "good hunting" and add to their existing record.

Yours faithfully

J. McCUNN.

Royal Veterinary College,
Royal College Street,
London, N.W.1.
January 24th, 1961.

"Ring womb" in the Ewe

Sir,—For 5 lambing seasons I have been engaged in rather spasmodic research into the aetiology of "ring womb" in the ewe.

Although no real conclusions have been reached, there does appear to be a connexion between the incidence of the condition and the prevailing weather conditions during pregnancy.

Thus, during seasons 56/57 and 57/58 when there was abundant grass available, 158 and 123 cases respectively occurred in a mixed practice in Devon. During 58/59 some 94 cases were presented. Although this season also produced abundant grass it was excessively wet, producing severe losses by fascioliasis both in actual deaths and debility. During the very dry season of 59/60 only 52 cases appeared. During this season there was a high incidence of single lambs largely due to the inability of the owners to flush their ewes. There was also a severe shortage of grass necessitating the ewes ranging widely during grazing.

If this connexion is valid, the coming season ought to show a quite marked incidence of the increase of "ring womb" in the south-west of England. This increase, to have any significance ought to be large enough to be apparent even if no records are kept.

Could I appeal to colleagues in the south-west with appreciable sheep practice to take mental note during the coming season and let me know their opinions, either privately, or *via* your correspondence columns?

The condition as defined, is that in which the only abnormality is failure of the cervix to dilate.

At least 3 other conditions have led to confusion and suggestions that, in fact, the condition does not exist. These are: 1. Malpresentation (transverse, breech or anterior presentation with both head and leg flexion.) Dilatation fails through lack of pelvic stimulation. 2. Mineral imbalance or deficiency; hence reports that many cases respond to "mixed" borogluconate injections. 3. Premature lambings often detectable by lack of milk. This last group often dilates if left; caesarean section rarely results in viable lambs in these cases. It had been thought that the condition must be due to a hormone imbalance. The fact that in the true condition failure of the cervix to dilate is the only abnormality, appears to throw some doubt on this.

An apparent breed incidence would seem to be an artefact due to area/breed incidence.

During the last season a series of cervical biopsies were taken and examined histologically by Dr. Joan Dixon of the Liverpool veterinary school; these did indicate slight differences in the "ring womb" cases, but it is hoped to repeat this work during the coming season to confirm or refute this.

Yours faithfully,
J. C. HINDSON.

"Ivydale,"
North Tawton,
Devon.
January 20th, 1961.

"Disease" of Turkey Poults

Sir,—A disease very similar to that discussed by Stevens *et al.*, Smith, Swarbrick, Wannop and Mann, in THE VETERINARY RECORD of July 30th, August 6th, 13th and 27th, 1960, was seen at Glenfield during 1955 and 1956 in several outbreaks among turkey poults and one among chickens. Both symptomatology and gross pathology closely resemble the description given by these authors. As the condition had not been observed in Australia until then, special attention was paid to the first 2 outbreaks, which occurred in 2 large commercial turkey hatcheries.

In each case, poults between 3 and 6 weeks of age were involved, although odd losses occurred among breeding hens and these showed the same *post-mortem* findings as the poults. The condition was characterised by sudden onset and sudden death of birds, mostly those in good condition. There was generalised oedema with pronounced ascites, followed by hydrothorax, hydropericardium and occasionally swelling under the lower beak. Other lesions included congestion of kidneys, pale musculature and liver, slight to moderate catarrhal enteritis and sometimes petechiae in the liver.

In one outbreak, no change in feeding could be associated with the initial appearance of the disease. Aureomycin at the rate of 200 g. per ton of mash proved very effective; but due to the cost involved the owner tried several times to eliminate it from the ration and the losses recommenced almost immediately. Later he found that by including newly-harvested wheat in the feed, there was a rapid clinical improvement in the sick birds and deaths ceased. A few weeks afterwards, poor quality meat meal was used and the trouble flared up again but disappeared as soon as a new batch of meat meal was introduced.

The second outbreak occurred in poults 4 days after they had been placed on a new batch of feed containing low quality wheat. When the disease appeared, 3 treatments were tried. The first group, consisting of 13 very sick poults, was treated with Terramycin, each bird receiving a drench containing 65 mg. of the drug in 1.5 ml. of water. Four birds died but the remainder made a complete recovery within 24 hours. Of the others, a group of 196 birds, selected at random, received the suspected feed and Terramycin (0.75 g. per gal.) in the drinking water. Sick birds showed complete recovery and deaths ceased within a few hours of the commencement of the treatment. In the remaining 100 birds, an initial improvement was obtained when molasses (5 fl. oz. per gal.) was added to the drinking water and the birds were returned to the mash which they had been fed until 4 days prior to the outbreak. However, the general appearance of this group deteriorated after 4 days. Molasses was then replaced by Terramycin (0.75 g. per gal.) in the drinking water and spectacular improvement was again obtained.

Although gross pathology in these outbreaks differed considerably from the common lesions usually seen in avian monocytosis, our diagnosis of this disease was based primarily on haematological examination and the failure to demonstrate any known specific organisms or to transmit the disease. Moderate leucocytosis with a monocytic shift was the most consistent finding in 20 birds examined. The history of the change in feeding prior to the outbreak, and the spectacular response to Aureomycin or Terramycin or to a partial or complete change of feed, also support this diagnosis.

In the first outbreak, haemorrhagic syndrome was considered as a possibility due to the paleness of the musculature and the liver, as well as the watery appearance of the blood. However, blood clotting time of 5 sick birds did not differ from the 2 controls and appeared to be within the normal limits, although haemoglobin values in 3 of these birds were low, the values being 2.0, 2.3, 3.7, 9.9 and 10.4 as compared with 9.8 and 10.5 grammes per 100 ml. in the 2 controls. Furthermore, in our experience there is always erythroblastosis and leucopenia, as well as a history of sulphaquinoxaline or antibiotic treatment, associated with haemorrhagic syndrome. This was not the case in the outbreaks described.

A case of suspected alimentary toxaemia in chickens, similar to that described by Sanger *et al.* (1958) came to our notice at about the same time as the 2 outbreaks in turkey poults occurred. This condition, which in our opinion was caused by low protein meat meal toxicity, resembled the "disease" as regards generalised oedema, but there was no change in the blood picture and the treatment with antibiotics and molasses was ineffective. In this case, mortality ceased approximately 7 days after the birds were fed a new mash.

Yours faithfully,
B. SINKOVIC.

Veterinary Research Station,
Glenfield,
New South Wales.
November 4th, 1960.

Reference

SANGER, V. L., SCOTT, L., HAMDY, A., GALE, C., & POUNDEN, W. D. (1958). *J. Am. Vet. Med. Ass.* **133**. 172.

Veterinary Inspection for Laboratory Animals

Sir,—In the SUPPLEMENT to THE VETERINARY RECORD of last December, I read with interest the report on Home Office control of laboratory animals.

I cannot help feeling that, with antivivisection campaigning of the public particularly prevalent at the moment, now is surely the opportune time to press the Home Office for the appointment of veterinary inspectors. Would not a philosophy of

"head in the sand" in the long run tend to be more damaging to the profession in the public eye, than a genuine attempt to concern ourselves with the welfare of the laboratory animal? The advantages of veterinary supervision are, I am sure, too obvious to list here. If only one appointment is at best all that may accrue, is not a "hopeless minority" preferable at first to no veterinary influence at all?

Yours faithfully,
E. G. HARTLEY.

10 Victoria Road,
Broadstairs,
Kent.
January 20th, 1961.

"Muscular Hypertrophy" in a New-born Friesian Calf

Sir,—On May 21st, 1960, a 3-year-old Friesian heifer was admitted to the Department of Veterinary Clinical Studies at Cambridge. Second stage labour had commenced at noon. An attempt to calve the heifer by ordinary methods had been unsuccessful and the veterinary surgeon in charge of the case referred the animal to the Cambridge hospital for caesarean section.

The heifer was admitted at 5.30 p.m. Vaginal examination revealed a large calf in posterior presentation. Both hind legs were in the vagina and one foot was protruding from the vulva, but the calf was not engaged in the maternal pelvis. The cervix was fully dilated: straining was very occasional and weak.

An ounce and a half of chloral hydrate in 2 gallons of warm water was then given by stomach tube and a left paravertebral block (T13, L1, 2, 3) carried out. A dead bull calf weighing 103 lb. was delivered through a vertical left flank incision.

On examination of the calf it was found that it resembled the "Buffalo" type of animal described in South Devon Cattle by Mackellar (1960). Overall muscle development was marked and was most noticeable in the hindquarters which had a pronounced convex curve due to the large size of the hamstring muscles. As in the South Devon "Buffaloes" the tail appeared to be set on further forward than normal and lay in a channel or groove bounded by the semimembranosus muscles on either side.

It is thought that the degree of muscular development present in this calf was of primary importance in producing the dystocia.

Yours faithfully,
DONALD STEVEN.

University of Cambridge,
Sub-department of Veterinary Anatomy,
Tennis Court Road,
Cambridge.
January 12th, 1961.

Reference

MACKELLAR, J. C. (1960). *Vet. Rec.* **72**. 507.

The Veterinary Nurse-receptionist

Sir,—May I, through the courtesy of your columns, make the following comments on Miss Valerie K. Johnston's letter in THE VETERINARY RECORD dated January 21st?

For the last seven and a half years, it has been my lot to play the rôle of veterinary nurse-receptionist-cum-secretary, in short the "lay staff," of a single-handed mixed practice. My title has ranged from "the vet's missus" down to "office girl" and others, perhaps not so complimentary but too numerous to record.

Far from finding the work "soul destroying," I (and I am sure I am one of many) find the job rewarding and more than worth while. If the case on hand is successful, whether it be a rumenotomy, hysterectomy, or a simple tooth extraction, therein lies my reward and recognition, small though my rôle may have been. After all, is a name, or a status so important when helping to relieve pain, or saving a life? I think not.

Yours faithfully,
MOLLIE PASCOE.

Sunnyside,
Whitchurch,
Hants.
January 23rd, 1961.

Sir,—I sympathise with Miss Johnston, having read her letter of January 21st.

The onus and the expense of training lay assistants lies mainly on the private practitioner, for it is he who has to provide a salary and keep, when for six wearisome months the trainee is a burden to him.

After this time she more than earns her due. Strangely enough, the only establishments offering a set course on kennelwork and veterinary lay assistance are owned by lay people, some of whom demand quite a high fee, but in return often turn out very capable people. One such establishment even has its own operating theatre for veterinary surgeons to demonstrate in!

Shame on us! We all know that a good lay assistant is worth his or her weight in gold, especially if coming into direct contact with our clients or acting as receptionist.

Let us, therefore, immediately arrange twice-yearly lay assistant examinations at all our veterinary colleges. Conditions of entry should be that a trainee must have spent a year in a predominantly small-animal practice, and have reached a given standard at school. On passing the examination the trainee would obtain a diploma which would give him or her a good job anywhere, with a minimal scale of salary laid down for any given area.

Graduates could form their own Society and/or clubs.

Yours faithfully,
R. HODDINOTT.

Mill Pond House,
Hayle,
Cornwall.
January 23rd, 1961.

Sir,—I have worked for the veterinary profession for seventeen years, six years longer than Miss Valerie K. Johnston, and I cannot accept her suggestion that this makes me less conscientious than she.

A training scheme for veterinary nurse-receptionists would be a great advantage to young girls who wish to take up this work, but I fail to see why its absence should have induced Miss Johnston to leave her calling in which she is already trained.

Many people make a great deal too much of what they are called, and can be very stuffy when not given their exact title. After several years in any job, including a veterinary practice, one acquires, or one hopes to acquire, some status and respect as a result of one's personality and ability, and the actual "label" is surely not very important.

Yours faithfully,
EDNA BLUNDEN.

59 High Street,
Old Woking,
Surrey.
January 24th, 1961.

Effeminator Springs in Cattle

Sir,—Recently, when a commercial representative* called on me, I had occasion to order some more of these springs. I was very surprised to learn from him that I was the only person in the country to use them, and thought, therefore, that my colleagues might be interested to hear of their use, as they have a limited use in general practice.

Some years ago, an article was published in your journal on the use of these springs in India, but unfortunately I cannot remember the title. Their object is to prevent breeding in unsuitable animals which in India cannot be destroyed, and soon after the appearance of this article I was confronted with an unusual request from a client. He wanted me to prevent some of his cattle from breeding. This client had several Bail herds on which the bulls ran with the cows and service was unrestricted. Naturally there were times when, for some reason or another, certain animals were listed for culling. He wanted to run these animals with the herd, and when dry sell them as barren for slaughter. The use of these springs appeared to be the answer and I used them with a high degree of success. They are inserted, with a special instrument, into the cervix so that it cannot close. The technique is easily performed, and to date no ill effects have been observed in treated animals.

Care should be taken that the uterus has undergone some degree of involution after parturition so that the cervix has contracted and will hold the spring. If this operation is done too soon after parturition there is a real risk that the spring will slip out into the vagina and the animal will conceive. This has occurred, but can be prevented by taking the precautions mentioned above. Usually only one spring is used, but two can be used if thought necessary. I have used these springs with success for some years for the reason described.

I thought members might be interested, especially those whose practices include such Bail herds.

Yours faithfully,
J. B. TUTT.

Dutch Cottage,
Littleton,
Nr. Winchester.
January 23rd, 1961.

*Arnold & Son Ltd.

Replies to Advertisements

Sir,—Many newly-qualified members of the profession will appreciate your note, "Replies to Advertisements," which has done much to expose a most regrettable state of affairs.

I am told that, of the advertisers who do not bother to answer their correspondence, by far the worst offenders are those who choose to use a box number for their correspondence. Apparently, the elementary courtesy of an acknowledgment is reserved only for the most suitable applicants, while the rejected applicant will hardly ever be told that a position has been filled.

The principle of "box number advertisements" has been widely criticised by new graduates, who find that the nature and locality of an appointment is, in most cases, not adequately described and the information itself may be liable to misunderstanding.

Would it not be agreed that members of the profession need accurate information in order to find employment in keeping with their ability and interests? If so, THE VETERINARY RECORD should reconsider its policy and refuse to accept box-number advertisements for the Appointments Vacant column.

Yours faithfully,
J. H. MARSTON,
President.

Students' Union Society,
Royal Veterinary College,
London, N.W.1.
January 16th, 1961.